

MACHINE TOOL BLUE BOOK


JANUARY 1945



HARDINGE
ELMIRA, N.Y.

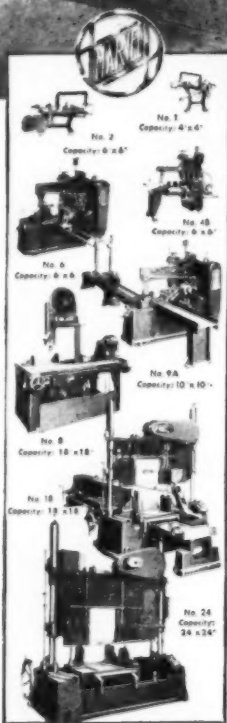
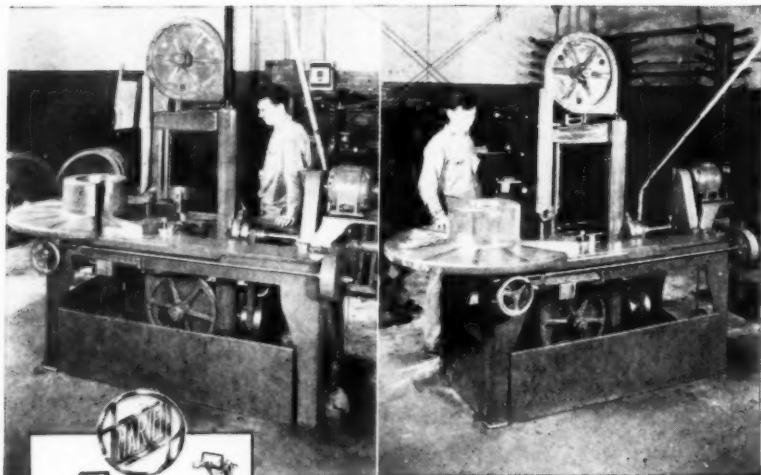
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Precision**

Experienced shop executives choose Hardinge High Speed Precision Machines for long life and unfailing accuracy to help in our war effort. The Hardinge nameplate is a warranty of quality.



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High Speed-Precision Lathe
1 Collet capacity 9" swing
8 spindle speeds up to 4000 r.p.m.

HARDINGE
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The No. 8 MARVEL Band Saw does the "Impossible"

This "impossible" job required the cutting into 12 equal sections of a cast steel ring 42" in diameter. The ring was to be an expanding chuck for stretching and sizing automobile tire rims. Each ring weighed 750 pounds, the length of the cut was 15" and the thickness of the material at the hub was over a foot in thickness. The sectioning of this ring with ordinary equipment was "impossible" because of the high cost involved and the special handling fixtures needed.

The Chicago Gear Mfg. Co., whose MARVEL Saws, including a No. 8 Band Saw, could take this job because, with this saw's broad planer-type bed, no special setting-up fixtures or tools were required and the regular operator could service this machine without interference with his regular work.

The MARVEL No. 8 handles all work up to 18" x 18" cross section and does cutting-off, mitering and notching. The blade feeds into the work at any angle from 45° right to 45° left. It is the most versatile metal-cutting saw built.

ARMSTRONG-BLUM MFG. CO.

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Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

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You get 1000 combinations of welding

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The right electrode for a specific application, when applied with PROPER CONTROL OF HEAT, will produce the desired properties in the weld. Guess work doesn't count, for example, in the welding of Stainless Steel as illustrated above, spoilage cannot be tolerated because it is one of the more costly metals and rejects mean a considerable loss in both time and material.

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to

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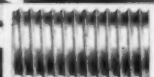
There is an army of unskilled operators ready to cut perfect threads with the Rivett Thread Tool. Not new, but proven, this tool helped win the last war and is again ready to throw its weight into Victory Production.

The Rivett Thread Tool is an attachment for any screw cutting engine lathe, and takes the place of single point thread tools commonly used. The tool is a holder for a ten tooth cutter with means for indexing the cutter to present each of the ten teeth progressively to the work. The first nine teeth rough out the thread in nine heavy, measured cuts, the tenth tooth finishes the thread. The responsibility of the operator is reduced to indexing the cutter when reversing the lathe. The thread tool does the rest.

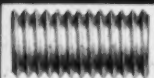
Descriptive bulletin and ordering instructions are available on request.



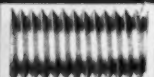
After Cut No. 1



After Cut No. 4



After Cut No. 7



After Cut No. 10

RIVETT

LATHE & GRINDER INC.
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HARDINGE

High Speed Precision

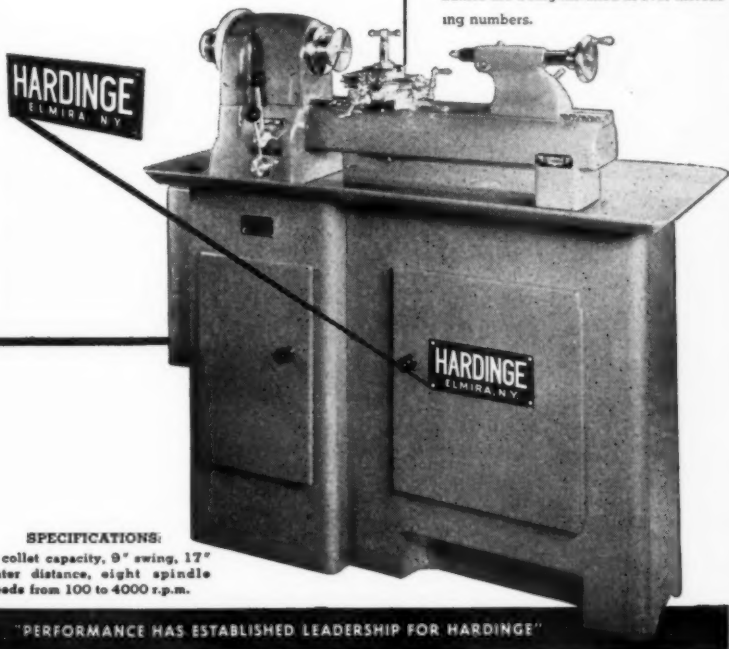
LATHE

is designed for accurate
tool room work

Designed to meet requirements of extreme lasting accuracy, high spindle speeds and the ease in operation required for the smaller diameter work range found in every tool room, laboratory and production department.

The simplicity of operation enables relatively unskilled operators to produce parts to the necessary close limits without expensive tooling. Your larger, expensive equipment will not meet all of the foregoing requirements necessary for practical results and proper economy.

Because of the many advantages found through actual use, Hardinge Precision Lathes are being installed in ever-increasing numbers.



SPECIFICATIONS:

1" collet capacity, 9" swing, 17" center distance, eight spindle speeds from 100 to 4000 r.p.m.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"



ARMSTRONG

Carbide

TOOL HOLDERS

ARMSTRONG Carbide TOOL HOLDERS have been specially designed and engineered for use with Carbide-tipped tool bits, and embody the special characteristics essential for the efficient use of carbide-tipped cutters, namely: great strength, extreme rigidity and close-up support for the cutting edge.

The ARMSTRONG Carbide TOOL HOLDERS System makes the use of carbide tools practical for everyday operations in tool rooms, maintenance departments and machine shops. Each takes interchangeable carbide-tipped tool bits ground to different cutter shapes . . . each tipped cutter can be used in a "Straight Right Hand Off-Set" or "Left Hand Off-Set Tool Holders." Hence a small investment in ARMSTRONG Carbide TOOL HOLDERS and carbide-tipped cutter bits can turn those hard-to-do machining operations into "just another routine job," changing losses into profits.

ARMSTRONG Carbide TOOL HOLDERS and Armide or other Carbide-tipped cutter-bits are now available at leading industrial supply houses.

Write for Bulletin.



ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

308 N. Francisco Ave.

Chicago 12, U. S. A.

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Machine Tool Blue Book

Hitchcock Publishing Co., 542 So. Dearborn St., Chicago 5

Published Monthly

Volume 41, No. 1

JANUARY 1945

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Specifically
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IN ONE PASS**



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Two GO rolls serve to pass parts that are not oversize and which will assemble. These rolls screen out parts which are oversize or which will not assemble because of an excessive error or combination of such errors in lead, angle and pitch diameter.

As the parts are passed from the GO or assembly rolls and are presented to the two NOT GO rolls, one of which is mounted so as to actuate a dial indicator, the dial shows whether the pitch diameter is too small and by how much. Should the pitch diameter be within tolerance limits and near basic, then it can be assumed that lead and angle are not only within tolerance limits but are also of the highest dimensional quality.

Full manufacturing tolerances may be utilized because wear allowance is compensated by adjusting the rolls on their eccentric axis.

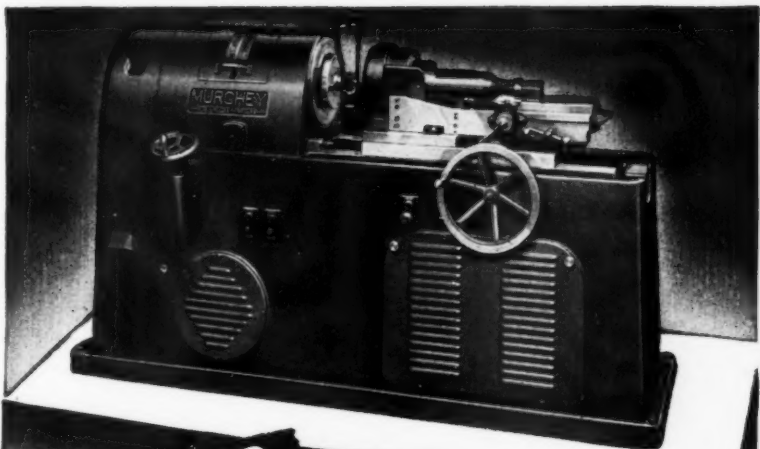
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and Shell Tapping Machines. Write for
literature on any or all of these products.*

MURCHEY

Cam controlled

Formerly a difficult and comparatively slow machining operation, *profile milling master rod caps* is now handled automatically on the equipment illustrated at the right. The machine, a CINCINNATI No. 2-24 Automatic Rise and Fall Miller, is equipped with a **Cam Roller Attachment for profile milling** . . . a standard "on demand" feature which may readily be built-in at the factory. The only special equipment, designed by CINCINNATI Application Engineers, is the single station hand-clamping fixture. After loading, the operator flips the starting lever and the machine goes through the entire operating cycle automatically.

This type of equipment has plenty of applications in the manufacture of civilian products. Talk it over with the engineers here at Milling Headquarters.

CINCINNATI No. 2-24 Automatic Rise and Fall Miller. Catalog M-909-1 contains complete details. Sweet's Catalog File gives a brief description of this and other CINCINNATI Milling Machines.



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FLY CUTTING MACHINES • PROFILE MILLING MACHINES • SURFACE GRINDING MACHINES • FILTER GRINDING

rise and fall miller

ACCURATELY DUPLICATES
PROFILE OF CAM

CINCINNATI

Profile milling side walls of aircraft engine master rod cap on a CINCINNATI No. 2-24 Automatic Rise and Fall Milling Machine with Cam Roller Attachment. The cutter mills a profile like this:

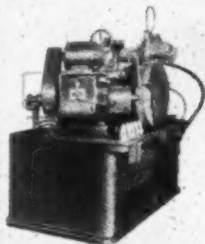
CINCINNATI GRINDERS INCORPORATED CINCINNATI OHIO, U.S.A.

MACHINE

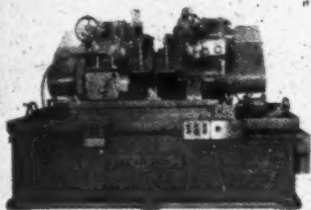
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it today.



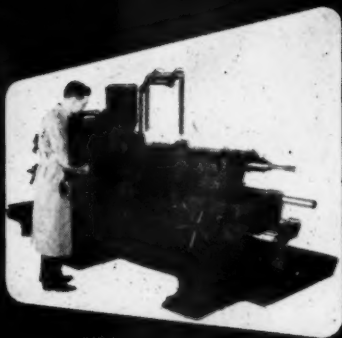
With reconversion ahead Fitchburg users should keep in mind all Fitchburg Bowgag Head Precision Grinding Wheelhead Units are standard and interchangeable

If the grinding operations for which they were purchased are discontinued, the heads can be remounted on standard machines, or on new special bases, for operations other than the ones originally specified. This is particularly appreciated by those using Fitchburg Grinders for ordnance production.

This exclusive Fitchburg feature protects your investment, and we suggest that future buyers of special purpose grinders or plain cylindrical grinders first consult Fitchburg engineers. Write us today

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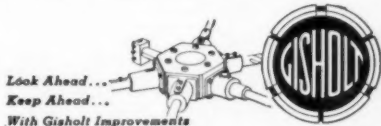
"TURRET LATHES—Their Operation and Use" is produced in full color and sound. It explains the basic design of various types of lathes, covers the field of turret lathe applications, shows methods of setting up machines for various types of work, familiarizes beginners with the location of controls, feeds and the fundamentals of their use. The turret lathe's versatility on many kinds of production work is vividly portrayed. Clear descriptions, accompanied by excellent photography with many close-ups, make this the most comprehensive and authentic presentation of its kind.

"TURRET LATHES—Their Operation and Use"

will be loaned without cost except shipping charges to recognized manufacturers, businesses, trade schools, and like organizations upon request. The film is available in 16-mm. size, with sound track. To arrange bookings, write the Gisholt Machine Company for complete information and order blanks. Take advantage of this audio-visual aid in industrial education.

GISHOLT MACHINE COMPANY

1185 East Washington Avenue, Madison 3, Wis.



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STANLEY



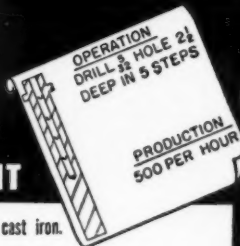
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**THE *Avey*
CAM FEED UNIT**



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**Designed for DEEP HOLE DRILLING
—(step method)—using rotating
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station required depends on depth
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Deep hole drilled in time required to drill one-fifth of depth — free loading time and five times single spindle production.

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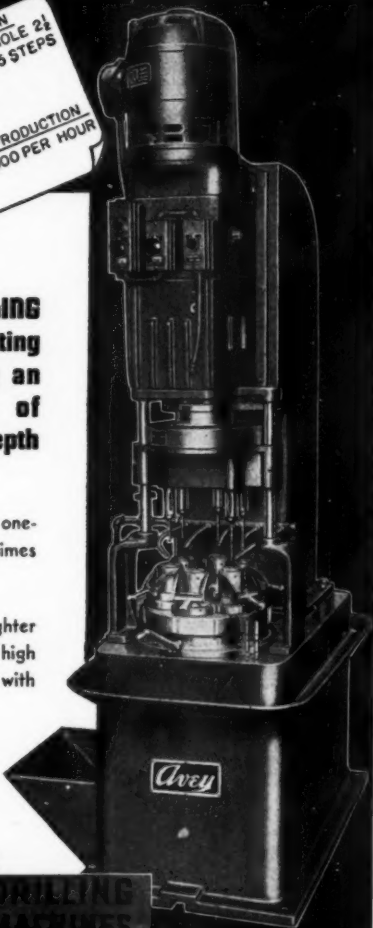


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Avey
CINCINNATI, OHIO

**DRILLING
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THE *Springfield* PRECISION LATHE

Tool Room Lathes are equipped with lead screw reversing mechanism, producing right and left hand threads and feeds. Has automatic stops for both lead screw and feed rod. Oil pan is also included as regular equipment. Bed constructed of High Test Nickel Chrome Gray Iron.

Gear box is tongued, grooved and bolted to front of bed and is the enclosed type to exclude dirt and chips from gears. Wide gears and heavy shafts with ball and bronzed bearings used throughout.

36 changes of threads and feeds are obtained, and in connection with the reverse gears, either right or left hand threads can be produced without the use of wrenches.

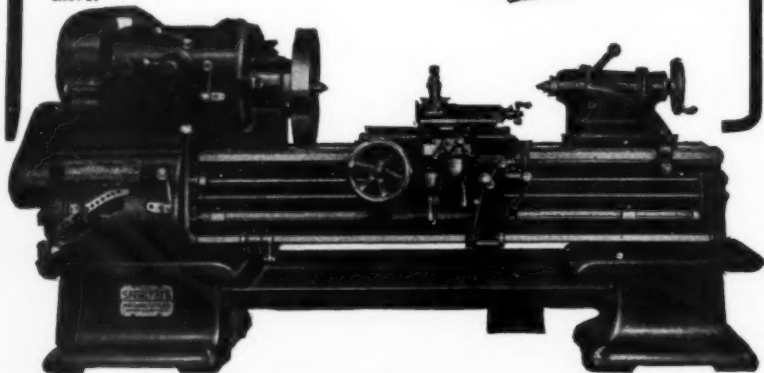
Massive tailstock, designed and constructed with long bearings on bed, is commensurate with the powerful headstock. All bearings and ways are oiled from one well.

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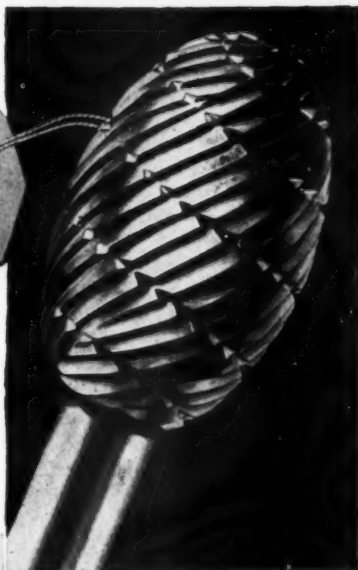
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MEN, MONEY
and MATERIALS**

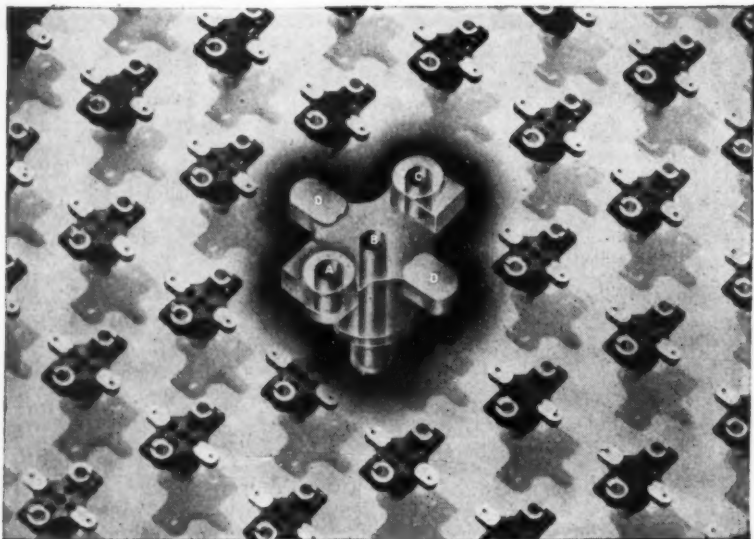
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For this versatile machine often outperforms production machines. Here's proof:

Holes A, B and C were located to $\pm .0005''$, sized to $\pm .0005''$ — $\pm .0000''$ and parallel to $.001''$ checked on plugs $1''$ long, two pads D milled to $\pm .001''$... in one set-up.

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Remember this versatility when you specify your next jig borer. Meanwhile, write for illustrated literature.

MOORE SPECIAL TOOL CO., INC.
728 UNION AVENUE, BRIDGEPORT 7, CONN.

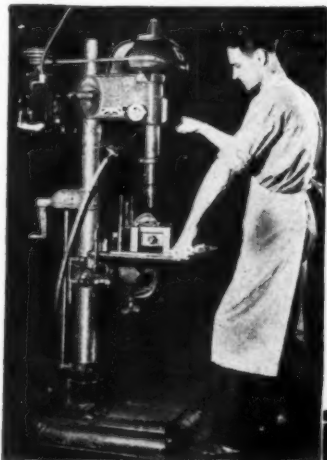
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SPOTS, DRILLS, BORES, REAMS...WITH MINIMUM TOOL CHANGES



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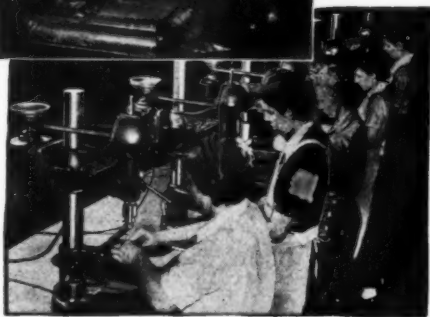


Unlike many of the machine tools now engaged in producing war materials, Buffalo Drills are ready to go right ahead on post war production when the time comes.

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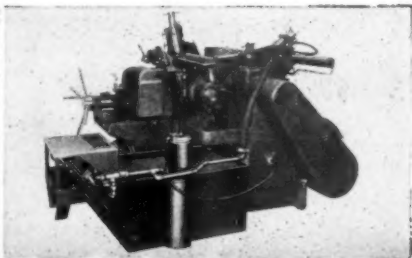


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At right: Hoffman Model I-12VC Filter installed on Cincinnati No. 2 Centerless grinder. Other Hoffman models are available for other machines and for installation in centralized systems.



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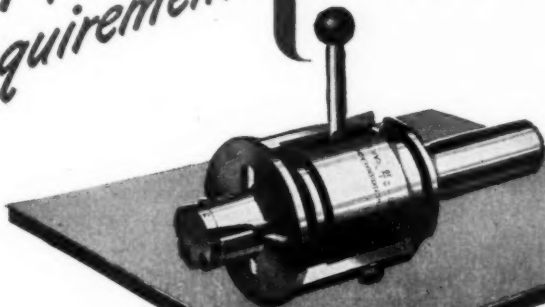
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meets them
ALL*

This new "RST" Collapsible Tap retains the design advantages of back supporting chasers their full length on heavy core piece, side supporting by heavy body—stamina for tough alloys.

Ground thread chasers—for fit and finish.

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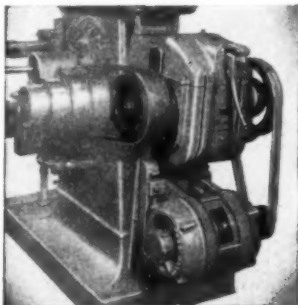
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At Last

a standard marking system
for grinding wheels

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For the convenience of customers, until the new uniform system becomes universal, Abrasive Company wheels will bear two markings—one according to the old system, one according to the new.

Users are cautioned that while wheels of different makers may be marked alike, they will not necessarily grind alike. In selecting wheels, therefore, it is always advisable to consult the Abrasive Company's Grinding Wheel Data Book Supplement which lists General Recommendations, using the New Marking System, for a wide range of materials and jobs.



The Abrasive Co. Trade-Mark on any Grinding Wheel assures accuracy to specifications indicated by the Marking.



DISTRIBUTORS IN ALL PRINCIPAL CITIES



1 Folder describes and illustrates the New Standard Marking System and shows how it differs from former system. Should be in the hands of all buyers and users.



2 Handy simple chart for ready reference to the New Standard Marking System. Get one for everyone in your plant who is concerned with Grinding Wheels.



3 120 page GRINDING WHEEL DATA BOOK is an authentic manual. Descriptive data on the use and application of Abrasive Company Products.



Supplement to the GRINDING WHEEL DATA BOOK lists general grain and grade recommendations for 177 grinding classifications according to New Standard Marking System.

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ABRASIVE COMPANY, Philadelphia 37, Pa.

Division of Simonds Saw and Steel Company

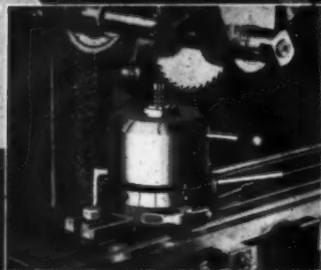
Please send Guides to New Marking System as follows: No. 1 ☐ No. 2 ☐ No. 3 ☐ No. 4 ☐

NAME

ADDRESS

Allison

COLLET CHUCKS



Above is Allison Indexing base mounted with an Allison #1 chuck doing second operation work.

Model #1 for $1\frac{1}{2}$ " 8-thread spindle lathes — with $\frac{7}{8}$ " collet capacity is unsurpassed as a combination chuck for either first or second operation work.

Allison

TOOL & ENGINEERING COMPANY
4031 Whittier Blvd., Los Angeles 23, Calif.

WRITE FOR NEW ALLISON CATALOGUE — SEE YOUR LOCAL DISTRIBUTOR



It is reported that

So tough is one new kind of glass that a searchlight lens made of it resists the heat of an 800 million candlepower lamp even though snow falls on the outside. *"Tuf-flex", Libby-Owens-Ford.*

get ready with CONE for tomorrow

Thermite (as used in incendiary bombs) has been applied to the demolition of metal structures. *McGraw-Hill Overseas Digest.*

get ready with CONE for tomorrow

A new magnetic floor sweeper for factories looks like a lawn mower and picks up nails, scrap, small parts, and tools. *Stearns Magnetic Mfg Co., Milwaukee.*

get ready with CONE for tomorrow

One of our aircraft manufacturers has complete plans for fitting a new fuselage, with luxurious interior, to the wings and engines of war-time bombers. *Consolidated Vultee Aircraft Corporation.*

get ready with CONE for tomorrow

In a newly-designed twelve-story parking garage, a single attendant can put away or bring out any one of 110 automobiles by merely pushing a button. *Park-O-Mat Co., Los Angeles.*

get ready with CONE for tomorrow

Plans are well advanced for annual trade fairs, on the European plan, in several American cities. *Bureau of Foreign and Domestic Commerce, Washington, D. C.*

get ready with CONE for tomorrow

Two hundred police chiefs recently witnessed a demonstration of a tiny radio receiver about the size of a pack of playing cards. *Hytron Corporation, Salem, Mass.*

get ready with CONE for tomorrow

The "Axonograph" is a device that photographically produces an axonometric drawing directly from a blueprint. *Glenn L. Martin Co., Baltimore.*

One manufacturer of electric appliances is already displaying his post-war models in order to gauge public tastes and preferences. *Proctor Electric Co., Philadelphia.*

get ready with CONE for tomorrow

"Fly-it-yourself" service is being planned on a basis similar to that of the familiar rented automobile service. *R. S. Robie, Boston.*

get ready with CONE for tomorrow

A "slot-machine" mail box accepts payment, stamps a letter and holds it for collection. *"Mailomat", Pitney-Bowes, Stamford, Conn.*

get ready with CONE for tomorrow

A new molding plastic is non-organic and will stand heat to 420° centigrade. *Mycatex Corp., Clifton, N. J.*

A new chemical, when sprayed on the soil of gardens, is absorbed by the plant and kills many insects and fungi. By this means potato crops are said to have been increased as much as 40 bushels per acre. *Rohm and Haas Co.*

get ready with CONE for tomorrow

A prominent scientist states that he believes that a temperature of absolute zero (-273.1° C.) may soon be attained. *Prof. Peter Debye, Cornell Univ.*

get ready with CONE for tomorrow

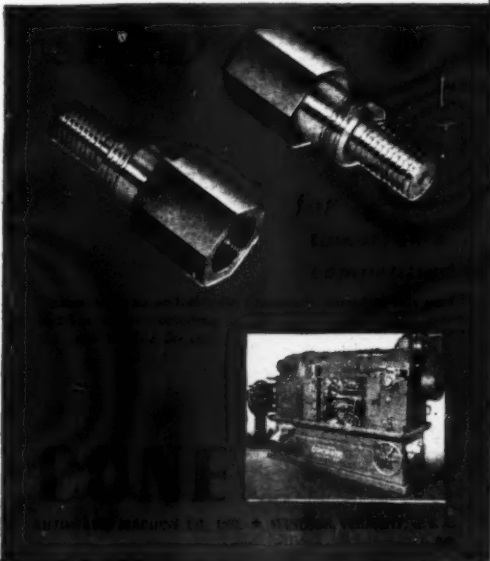
The new space-saving square milk bottles are already in use by one dairy. *Sanitary Farm Dairies, Cedar Rapids, Iowa.*

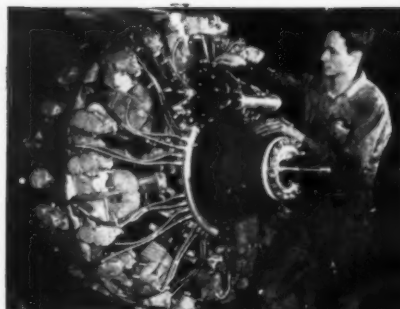
get ready with CONE for tomorrow

An electric motor has been built that develops 30 horsepower and weighs only 57 pounds. *General Electric Co.*

get ready with CONE for tomorrow

Paper forms for poured concrete are being used. *Sonoco Products Co., Hartsville, S. C.*





ARTER ROTARY SURFACE GRINDERS and the new marvel of the skies – Boeing 29 Superfortress

Each Superfortress employs four Wright 2200 h.p. engines; and the spherical form on the outside of crankcase is successfully ground in high production by Arter Rotary Surface Grinders. Crankcase section is centered accurately on magnetic

chuck adjusted to hold the center of the spherical surface exactly in line with center of grinding wheel. With rotation of crankcase, in horizontal plane, its edge is intersected by edge of cup-shaped grinding wheel rotating in vertical plane.

Arter Rotary Grinding Machines are Versatile Grinders

ARTER GRINDING MACHINE COMPANY

WORCESTER, MASSACHUSETTS • U. S. A.



Multi-ribbed wheel thread grinding

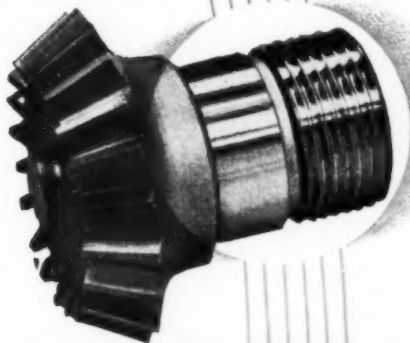
FULLY AUTOMATIC WORK CYCLE—INCLUDING THE DIAMOND DRESSING OF THE WHEEL



WE are now equipping Jones & Lamson Automatic Thread Grinders for grinding threads and other forms, with a multi-form wheel. The scope and productive advantages of this method are greatly increased by the **FULLY AUTOMATIC WORK CYCLE OF THESE MACHINES.**

The grinding wheel is diamond dressed by an Automatic Multi-form Truing Device; consequently an accurate, free cutting wheel is obtained, and either resinoid or vitrified wheels can be used. With this same Truing Device, the **20-INCH DIAMETER WHEEL** can be dressed for three different methods of multi-ribbed wheel thread grinding, as well as for many varieties of plunge-cut form grinding.

The fully automatic work cycle of Jones & Lamson Thread Grinders means greater production and greater profits. Consult us for recommendations and more detailed information. Your inquiries will receive our prompt attention.



THREAD SPECIFICATION

1-3/16" — 12 N.S. — Class 3

MATERIAL

SAE — 4620 — Heat treated

MACHINE CYCLE

20 seconds per piece — 20 pieces between wheel dressings.

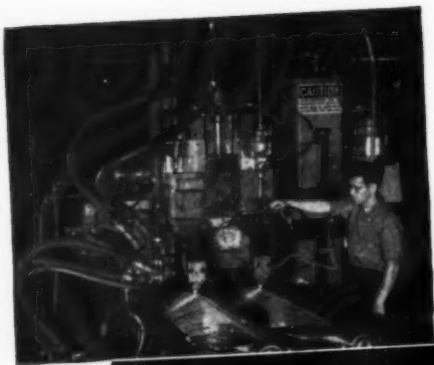
WHEEL DRESSING CYCLE

35 seconds. Controlled by electric counter, thus maintaining fully automatic work cycle.



JONES & LAMSON MACHINE COMPANY
SPRINGFIELD, VERMONT, U.S.A.

Manufacturer of: Universal Turret Lathes • Fly Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers



How TURCHAN CONVERTS A HAND-JOB INTO A MACHINE-JOB !

"Turn to Turchan"

SEND

Sample or Blueprint
of Parts for Turchan
Production Estimate

Formerly the production of propeller blades was strictly a hand-job. Then along came the Turchan and converted it into a simple machine-job of profiling with a planer — performing the operation in 1/20th of the time.

Using a model as a guide, the Turchan Attachment is shown above planing the irregular contour on a forged member of a 2-piece brazed propeller blade, planing it to close tolerances. On other similar operations, such as planing turbine blades, impellers, and large cams of irregular shapes, tolerances are also held very close.

If your production problem is one of finishing parts of irregular or eccentric shape on milling machines, lathes, grinders, planers, shapers or boring mills, send us the part or a blueprint and we'll tell you how the Turchan Attachment can be used to your definite advantage.

TURCHAN

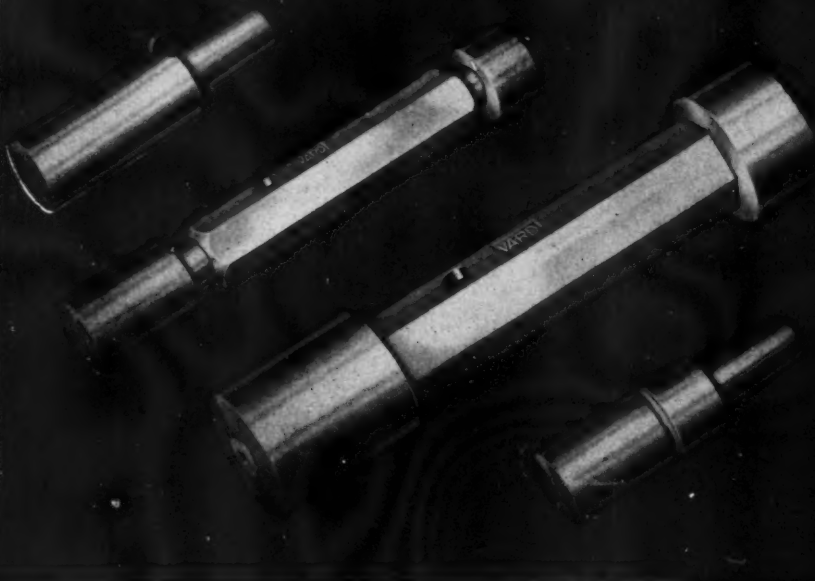
Turchan Follower Machine Co.
8253 Livernois Detroit 4, Mich.

Hydraulic Follower Machine

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.05
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and
dle
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BUY

ACCURATE CYLINDRICAL PLUG GAGES



★ VARD cylindrical plug gages are made in complete range of sizes from .050 to 10-in. diameter; ground from Timken Graph-Mo steel, plain or hard chrome plated, or Norbide on order. Four types of gages illustrated here. *Top to bottom* — extra-long taper-lock member, taper-lock handle with GO and NO GO members, tri-lock handle with similar members and a progressive taper-lock member ★ VARD gages are accurate; give long service.



Right: VARD recommends that GO member cylindrical plug gages in Class XX, X, and Y be ordered with the special pilot. This patented feature speeds alignment... more than triples the inspection output.

BUY WAR BONDS • BUY A VICTORY

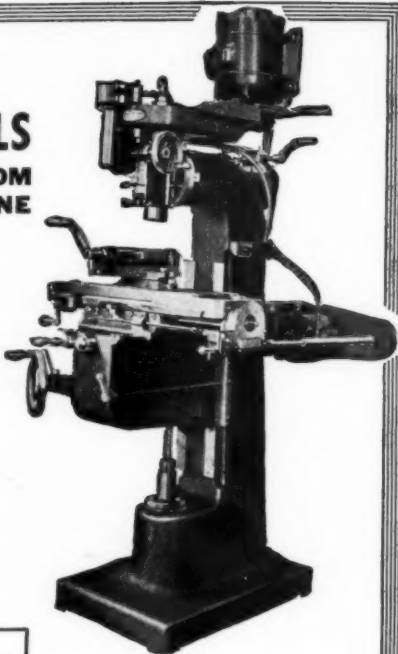
VARD INC.
PASADENA 3, CALIF.

INDEX VERTICAL MILLS FOR THE TOOL ROOM OR PRODUCTION LINE

Milling, Drilling or Boring.
Verniers or Rods and Indicators for
locating. Ask the shop that has one.
Better still, ask the shop that has
an Index and also another of com-
petitive make.

WE are pleased to announce a
rod and indicator set available
for installation on Index Mills,
either new at the factory, or used
machines already in the field. Set
consists of two indicators graduated
in .0001", two micrometer heads
graduated in .0001", necessary pre-
cision rods for locating in an area
8"x16", and troughs for holding
rods cross and longitudinal.

This makes it possible for you to
obtain, at an astonishingly low
price, a precision locator as well
as a vertical mill which has al-
ready proven its merits in the tool
room and production line. Rod and
Indicator sets available for other
machines also.



12" TOOL ROOM ROTARY TABLE

Mfd. by Index Machine & Tool Co.

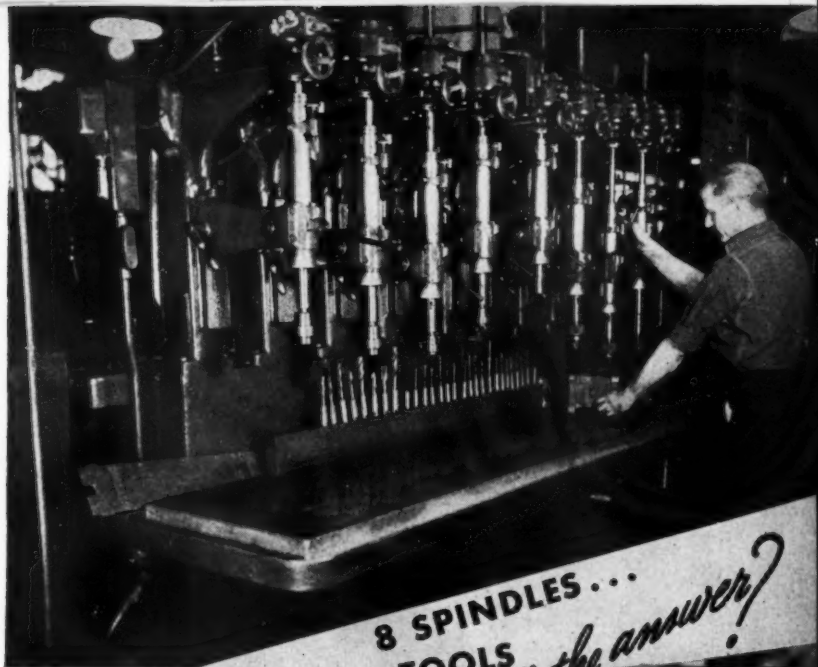


A quality tool for precision work in the tool room
or production line, incorporating such features as
ball bearings—hardened and ground worm—quick
acting throw-out for free hand turning—single
movement table lock that does not cramp table out
of alignment—compound trough. 12" size only.

Write to Factory Sales and Distributing
Agents for complete information.

BLANK & BUXTON MACHINERY CO.

3100 E. MICHIGAN AVE.
JACKSON, MICHIGAN



8 SPINDLES ...
32 TOOLS

What's the answer?

MODERN-MAGIC CHUCK AND COLLET EQUIPMENT

The above set-up is a typical example of what can be done with MODERN Magic Quick Change Chuck and Collet equipment. Here, four spindles of the machine, equipped with MODERN Magic Chucks, perform twenty-eight separate operations.

The twenty-eight tools are easily and quickly changed without stopping or even slowing the machine. Bulletin M-101 gives complete details on MODERN Magic Quick Change Chuck and Collet equipment. Send for your copy today.

PROMPT SHIPMENT.....USUALLY MADE FROM STOCK

MODERN TOOL WORKS

DIVISION OF
CONSOLIDATED MACHINE TOOL CORPORATION
ROCHESTER 10, NEW YORK

HOW TO REGRIND COMPOUND ANGLE TAPS 12 TIMES FASTER!

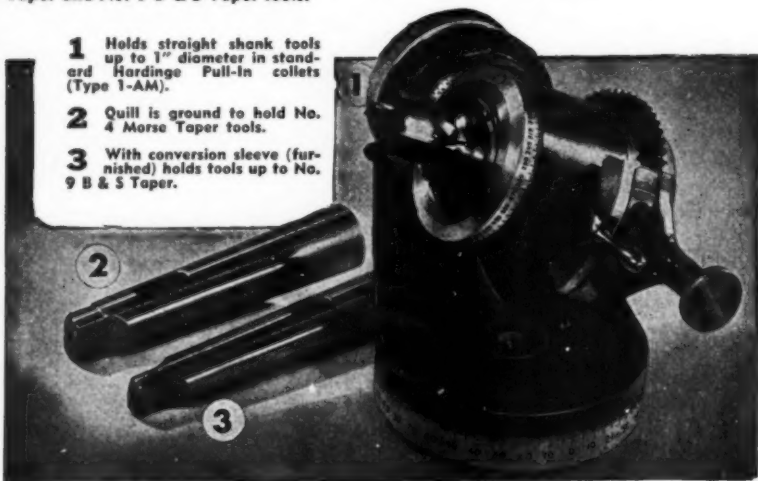
Now, with this Universal precision indexing head you can grind completely in 5 minutes what normally takes 2 to 3 hours of laborious trial and error work—and duplicate the factory finish on as many taps as you want. Just check this case study—A special tap required 3 angles to be ground, a 45° breaking angle, a 15° gun barrel angle and a 3° hook angle on the gun barrel angle. Using the 3 indexing planes (an exclusive feature), only 2 passes per flute under the wheel were necessary to get number fit and exact duplication.

INDEXES 360° IN THREE PLANES

You, too, can use this remarkable attachment profitably. Holds tools firmly, indexes 360° in each of three planes, for any possible simple or compound angle. Bolts onto any tool or surface grinder you may have. Gives you higher precision work because you needn't shift tool in holder. Vernier lever rotates work collet

UNIVERSAL THREE PLANE INDEXING HEAD is the only head of its kind . . . can be used on ANY tool or surface grinder . . . holds straight shank, No. 4 Morse Taper and No. 9 B & S Taper tools.

- 1** Holds straight shank tools up to 1" diameter in standard Hardinge Pull-In collets (Type 1-AM).
- 2** Quill is ground to hold No. 4 Morse Taper tools.
- 3** With conversion sleeve (furnished) holds tools up to No. 9 B & S Taper.



between adjacent indexed points without changing index, giving you control to 1/10 of 1 degree.

You eliminate inaccuracies because all work is accomplished by mechanical setting, and less handling is required. Collet quill is carried on aviation ball bearings instead of ordinary sleeve bearings to reduce friction for spiral grinding. Result is greater accuracy and speed in regrinding tools.

GET COMPLETE STORY!

Investigate this unusual grinding attachment. In addition to holding all the standard tools listed below, it is easily adapted to holding irregular and large shank tools for grinding. Some even use it for light milling work. Among the prominent users who reorder are Boeing Aircraft, Chrysler, General Electric, Sperry Gyroscope, Nash-Kelvinator. Write today for the whole story. It will pay you.

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CLEVELAND, OHIO

SEND COUPON TODAY!

CLEVELAND TOOL ENGINEERING CO., 1249A
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Please send complete story and Data Sheet A
showing how Universal Indexing Head can help
me.

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The

OLIVER DIE MAKING MACHINE

Saves 50% to 60%

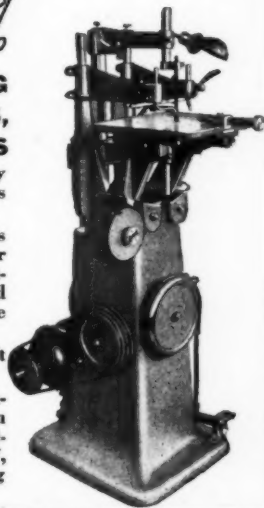
**OF THE COST OF MAKING
EXPENSIVE DIES, GAGES,
TEMPLATES and CAMS**

This versatile machine is equipped with every useful device for the rapid production of dies and similar tools.

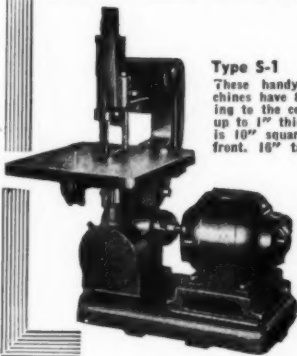
It has capacity for sawing and filing in metals up to 3" in thickness, and filing still heavier materials with a shorter stroke. Stroke is adjustable from 0" to 5" and 6 speeds are provided from 100 to 300. Sawing can be handled to the center of a 20" circle.

Table is 14" square, tilting 15° to the right, left and front, and 3° to the back.

Hydraulic feeding device provides constant controllable pressure on the down stroke of ram and relieves pressure entirely on up stroke. Feeding pressure is adjusted so that if left to itself, will feed a short distance and stop, preventing inadvertent work spoilage.



OLIVER OF ADRIAN



Type S-1

These handy bench type die making machines have 8½" throat, which permits sawing to the center of a 12" circle. Tool steel up to 1" thick may be sawed & filed. Table is 10" square. Tilts 10° to right, left and front. 16" table is available at extra cost.

OLIVER INSTRUMENT COMPANY

1408 Maumee St., E.

Adrian, Mich.

We also build Drill Grinders, Tool and Cutter Grinders, Face Mill Grinders, Template Tool Bit Grinders.

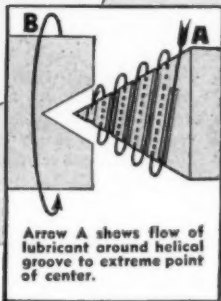
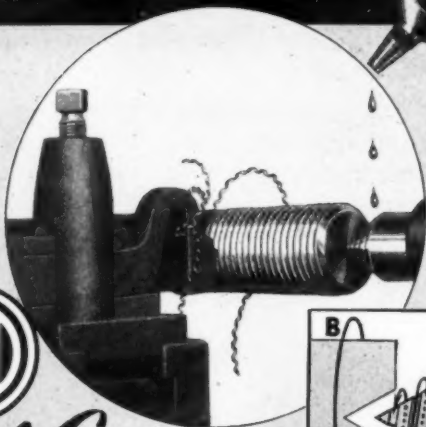
Let us send bulletins giving full information on Oliver die making machines. Prompt deliveries offered.

Lubricate Centers Without Stopping Machines

Use



Helical Groove CENTERS



Their exclusive helical groove conveys the oil to the extreme point of the center, where it covers the entire bearing surface. The groove holds a reserve supply of oil that flows constantly into the extreme point of the center. *Greater machine output* is only one of many advantages of CMD Helical Groove Centers. Send coupon for full details!

Write for **FREE**
Sample Kit!

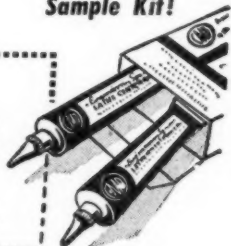
CHICAGO MANUFACTURING & DISTRIBUTING CO.
Dept. 18B, 1928 West 46th St., Chicago 9, Ill.

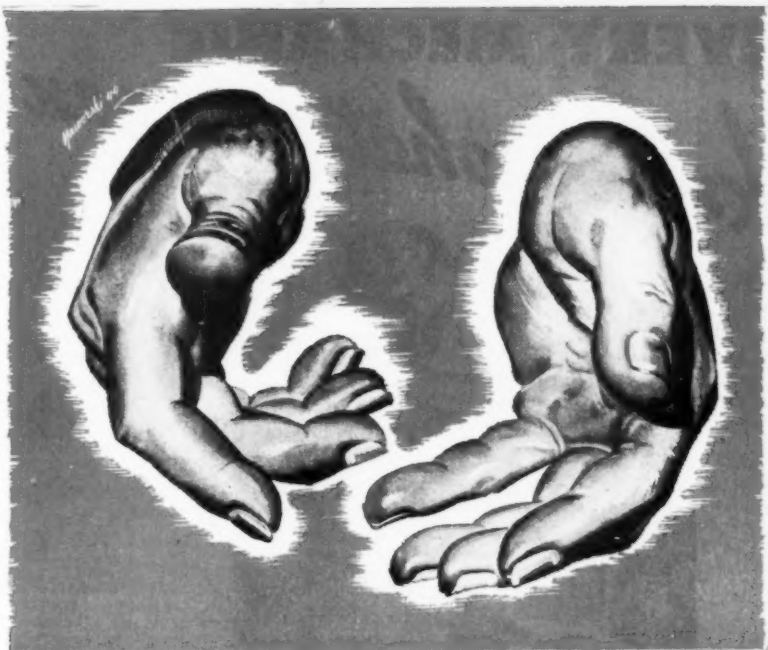
- ☐ Send circular on CMD Helical Groove Centers.
☐ Without obligation to us, send **FREE** sample kit containing a tube of CMD CENTER POINT OIL and a tube of CMD CENTER POINT LUBE (grease) with directions for making an amazing, simple test.

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ADDRESS.....





Save these for work a machine can't do



HC-5— $\frac{1}{2}$ H. P., multi-speed countershaft unit, 900 to 3600 R. P. M. Mounted bench-height on 3-leg caster base, 360° swivel.



There was a time, not so many years ago, when the words "Made by Hand" were synonymous with highest quality. In some things this still holds true.

But it is equally true that many operations can be done better and faster, with a greater degree of efficiency, when a Haskins Flexible Shaft Machine is used. And this with much less strain and fatigue on the part of the operator.

Grinding—Sanding—Rotary filing—Wire brushing—Buffing and Polishing—all are machine operations. There are many more. Write for Catalog 45, showing many ways to save your hands and speed production with flexible shaft equipment.

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EVERY MECHANIC

knows what we mean

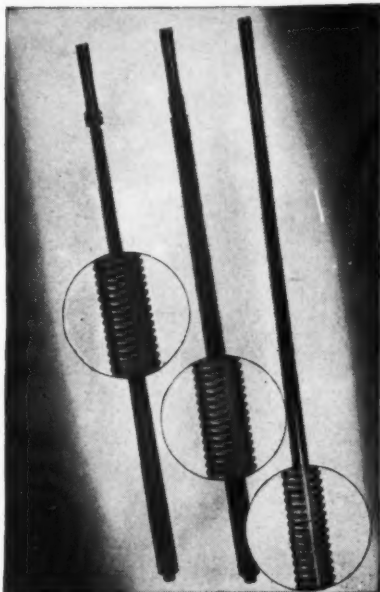


▶ **FAIRMOUNT Drop Forged Hand Tools** not only meet tough specifications as to structural design and tensile strength—they have the right **FEEL**. It's something impossible to describe, but every mechanic knows exactly what we mean.

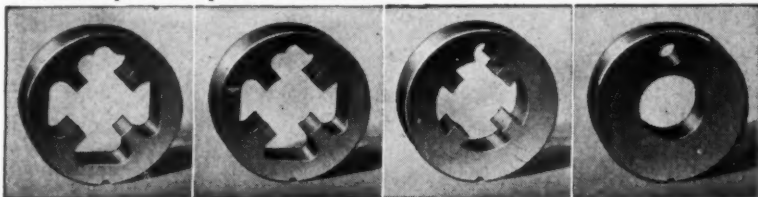


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The **FAIRMOUNT**
TOOL & FORGING COMPANY
10611 QUINCY AVENUE • CLEVELAND, OHIO



• 56 inches long overall, the above three broaches were used to perform the operation illustrated below.



Oper. No. 3. Third pass or finish broach. This broach establishes size and finish on spline widths, radii and flats.

Oper. No. 2. Second pass broach 1.800 to 2.238 leaving stock for finish broach.

Oper. No. 1. First pass broach cuts from 1.270 to 1.800 leaving a wide spline.

Blank before broaching, sides ground, small hole drilled and large hole drilled to receive pilot of broach.

*Now, it takes
only $\frac{1}{40}^{\text{th}}$ the time
to perform this
operation!*

**New method of producing cutting face
and chip area in threading dies**

Here is a graphic illustration of how the U. S. Broach engineers solved one manufacturer's production problem by designing these clover leaf shaped broaches to save him valuable man and machine hours.

If you have a problem in the precision cutting of production parts you will find that our engineers' wide experience will be helpful to you in affecting greater economy in your plant.

A letter will bring you full information about our organization.

U.S. BROACH
Company



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TELEPHONE TWINBROOK 1-3211

Universal Mikro-Lok Boring Bars for accurate finishing cuts

Universal Mikro-lok boring and reaming bars are the perfect tools for finishing cuts with extreme accuracy. They are especially adapted to boring to a shoulder, or to the bottom of a hole or for taking intermittent cuts.

A micrometer-like dial, easily and quickly adjusted, operates a unique mechanism which accurately sets the tool cutting edge to the required size. You can depend on the micrometer graduations to within .0005 inches. Rigid construction protects its accurate adjustability.

Universal Mikro-lok boring bars may be used effectively for light roughing cuts, semi finishing, and finishing cuts in one set-up. Available singly or in sets with Morse taper shanks or Swiss tapers for Jig Boring Machines, and special shanks and flanges for Diamond Boring Machines or other applications. Prompt delivery.

Write for information about these or any of the other Universal precision tools illustrated here.



UNIVERSAL TOOLS THAT WILL INCREASE PRODUCTION AND ACCURACY IN YOUR PLANT



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Drill Bushing



Index Plunger



Gripit



Collet Chuck with
N.M.M. Shank



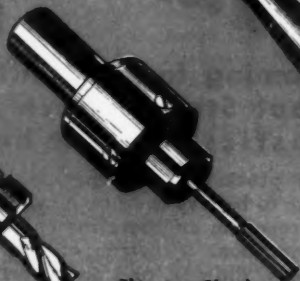
Mikro-lok
Boring Bar



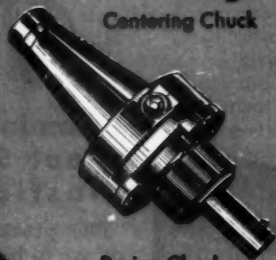
Centering Chuck



Standard
Collet Chuck



Floating Chuck



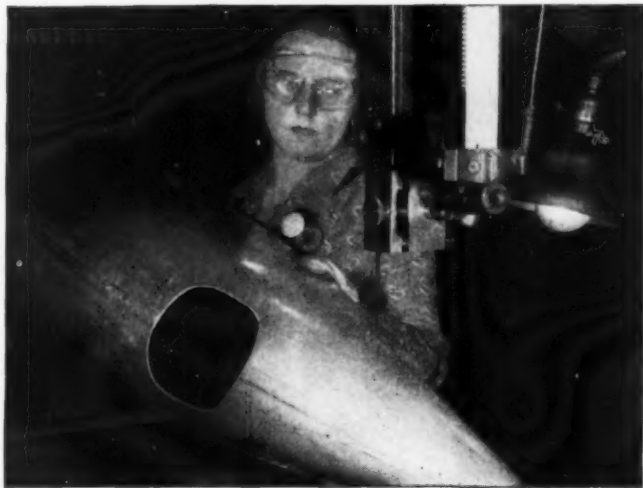
Boring Chuck



UNIVERSAL ENGINEERING CO.

FRANKENMUTH, MICHIGAN

FIGHTER PLANE GIVEN BY EMPLOYEES   BOND DEDUCTIONS BY EMPLOYEES



Friction Sawing with *Tannewitz* **HIGH SPEED BAND SAWS**

Trimming formed parts . . . Cutting Sheet Steel, 1-inch Armor Plate, Plastics or what have you . . .

"The process is to some so spectacular that they refuse to believe their own eyes"—so writes the chief tool research engineer for one of the largest aircraft corporations. Previous cutting costs are radically reduced, difficult and slow cutting of certain materials made swift, easy and safe. By all means write for your copy of "FRICTION SAWING" by Arthur A. Schwartz, Chief Tool Research Engineer, Bell Aircraft Corporation which will soon be off the press. It's free.



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Your Copy**

THE TANNEWITZ WORKS **GRAND RAPIDS
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CAN HELP YOU BE READY

for the RECONVERSION RUSH

When you get the "green light" for peacetime production you'll need action... *fast!* Tools and equipment to bring your product to market ahead of competition will be in heavy demand by every manufacturer.

There's a logical first step you should take now to assure yourself of getting the tools you know you'll need when the war job is done. Without in any way disrupting today's production for war, you can make practical plans and *take action now* toward building new products... new jobs... and new markets for tomorrow.

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600 W. Jackson Blvd., Chicago 6, Illinois

Thor
Portable Electric Tools
speed all jobs



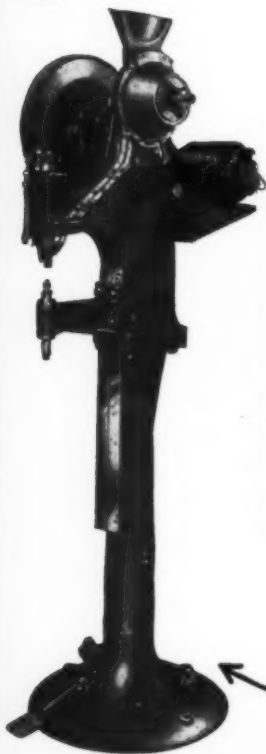
PORTABLE

Electric
TOOLS

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OUTPUT UP . . . RIVETING COST DOWN!



New "highs" in production, new "lows" in unit cost start the day you change from solid rivets to tubular or split rivets and Chicago Automatic Rivet Setters. Chicago Riveting is fully automatic . . . the rivet is fed, inserted and clinched with each trip of the foot pedal.

Have Chicago Rivet engineers analyze your rivet cost reduction possibilities now. Send us loose samples of your assemblies . . . we return them fully riveted, with accurately estimated riveting time schedules. When Army and Navy men see how much faster and better Chicago Riveting is, their usual advice is "Change now to Chicago Automatic Riveting."

*Typical Chicago Automatic Rivet Setter.
Other models available for setting up to
4 rivets at a time...bench or pedal types.*

Chicago Rivet CHICAGO RIVET & MACHINE CO.

9600 W. JACKSON BLVD., BELLWOOD, ILL., (Chicago Suburb)
TUBULAR AND SPLIT RIVETS IN ALL RIVET METALS

Do it with DALZEN



Left: Dalzen taps, in U. S., Metric, Whitworth, and Special forms are precision ground of hardened high speed steel or tungsten carbide.

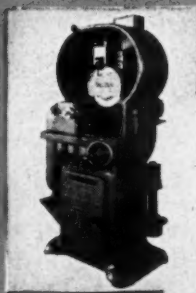


Left: High speed ground thread milling cutters, scientifically heat treated for longer life.

Below: No. 5 Electronic Thread Grinder. High production efficiency and accuracy by controlled wheel speed, other features.



Right: No. 2 Thread Grinder. Compact, upright design saves floor space. Simple to operate. Low first and maintenance cost. Ideal for short or production runs.



Below: Dalzen "2-in-1" combines a dependable accurate center lapping machine with a sturdy drill press.



Right: Parts are thread ground exactly to your specifications. Rigid inspection assures a uniform fine finish. Threads also cut or rolled.



DALZEN

TOOL AND MANUFACTURING CO.

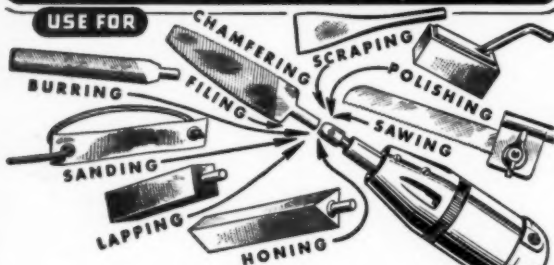
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NO OTHER TOOL LIKE **H&H** **RECIPROCATING ACTION**

PORTABLE *Electric* TOOL

★ **COMPLETE WITH MOTOR** ★

USE FOR



Motion is "in and out"—not spinning or rotary. Tool is portable—carry it anywhere—five pounds—easy to handle. Self contained. Ready to plug into any 110 volt electric outlet. Use it to work on any metal, wood, plastic or other materials that may be filed, sawed or polished. Delivers 1000 short, accurate strokes per minute, much faster than hand methods, no chattering. Complete line of files, scrapers, hones and other accessories available. Change accessories in 20 seconds. Used in largest plants and small shops.

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★ **SELF POWERED**—*one complete unit, no
power unit to buy—no motor to attach.*

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ROLLING ACTION

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RZEPPA CONSTANT VELOCITY UNIVERSAL JOINTS

Catalog on Request

RZEPPA

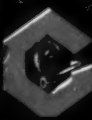
IF YOUR product design calls for the transmission of power from one rotating shaft to another, without vibration and the alternating acceleration and deceleration of old style universal joints, write for the new Rzeppa catalog.

This book explains the mechanical principles involved in transmitting vibrationless, constant, uniform power, and contains diagrams showing the destructive forces set up by older methods of transmitting power through various degrees of angularity.

Rzeppa Universal Joints are made in both the ball and disc types, in a wide range of sizes that are available for many industrial, automotive and marine applications. Full information will be sent on request.



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MACHINE COMPANY**

DETROIT, MICH. U.S.A.

A COMPLETE NEW LINE!

CENTRAL *Certified Accuracy* **MICROMETERS**
FOR IMMEDIATE DELIVERY!



**WRITE TODAY FOR
CATALOG #14**



• The entire line of individual Micrometers and complete sets illustrated and fully described. Write today to The Central Tool Co., Auburn, Rhode Island.

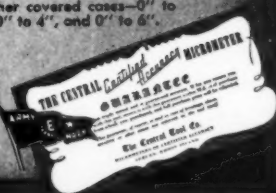
All frames forged of the finest special alloy steel . . . The new improved polished frame Micrometers in 1" and 2" sizes . . . The new black enamel finish Micrometers in all sizes from 1" to 6" . . . Also available with ratchet stop, lock nut and 10,000ths graduations . . . A full range of Metric Micrometers in addition to complete sets in leather covered cases—0" to 3", 0" to 4", and 0" to 6".



THE CENTRAL TOOL CO.

Micrometers of Certified Accuracy

AUBURN . . . RHODE ISLAND





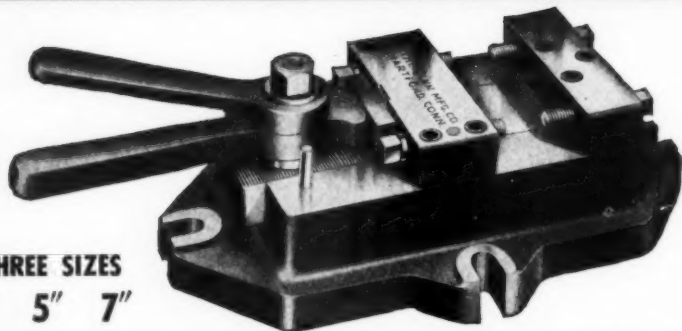
The ability to take punishment is built into every Ross Air Control Valve. With friction reduced to a minimum . . . with hardened steel used wherever there is a wearing surface . . . with an extra strength factor provided for every stress . . . and with an engineering design of utmost simplicity—Ross valves give long years of useful life. Many built more than 20 years ago are still in active service.

Representatives in Principal Centers

ROSS *Operating* VALVE CO.

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NOW NATIONALLY DISTRIBUTED THROUGH LEADING SUPPLY HOUSES



THREE SIZES

4" 5" 7"

FENN QUICK-ACTION VISE

A partial list of suppliers who are prepared to give you special service. If your territory is not listed write direct.

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Raleigh, North Carolina
The Globe Machinery & Supply Co.
Des Moines, Iowa
The Hardware & Supply Company
Akron, Ohio
The Jennison Hardware Company
Bay City, Michigan
Kasper & Koetzle, Inc.
Brooklyn 6, New York
Lafayette Tool & Supply Company
New York 13, N. Y.
Langdon Supply Company
Kansas City 7, Missouri
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The C. S. Mersick & Company
New Haven 7, Conn.
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Peden Iron & Steel Company
Houston 1, Texas
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THE FENN MANUFACTURING CO.

HARTFORD, CONNECTICUT

SAVE TIME . . . by FORM DRILLING

Now-

**FORM DRILLS DIRECT FROM
YOUR PART PRINT!**

CONNER form drills enable you to drill holes with irregular contours, such as flat bottom holes—holes with one or more tapers on the side—one or more radii in the form, or any other irregular shape. Also, **CONNER** standardized practice *entirely eliminates the cost of design*. We work directly from your part print.



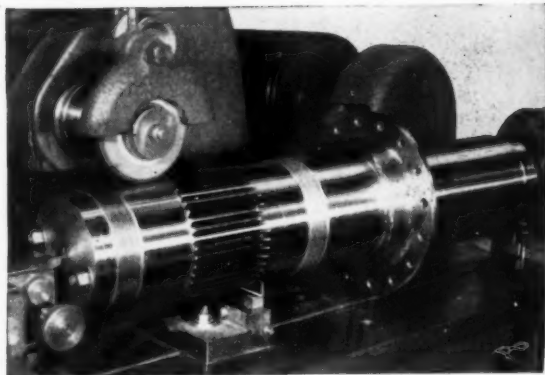
Form Drills to finish upper and lower cavities in drop forging dies. No. 13 B & S Taper Shank.

FOR DRILLING LARGE SIZE HOLES

Write for literature on **CONNER'S MULTI-TIP** drill equipment for form drilling—on **CONNER'S** special drilling applications—on **CONNER'S MULTI-TIP** drills for general use.

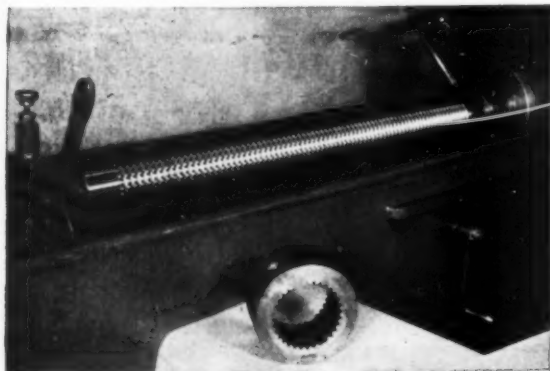
Conner
TOOL & CUTTER CO.
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Spline Grinding Aircraft Propeller Shaft



"In the Spotlight" for post-war

SPLINE BROACHES UP TO 84 INCHES LONG. Complete Broach Tooling and Engineering Service . . . GAGES, Serration or Spline, male or female . . . Master Gears and Gear Racks . . . Master Index Plates . . . Splined Arbors for gear-grinding . . . Hobbing, Shaving and Checking . . . Production Broaching and Machining. Available from stock, Radius Gages for checking form and hook on broach tooth forms.



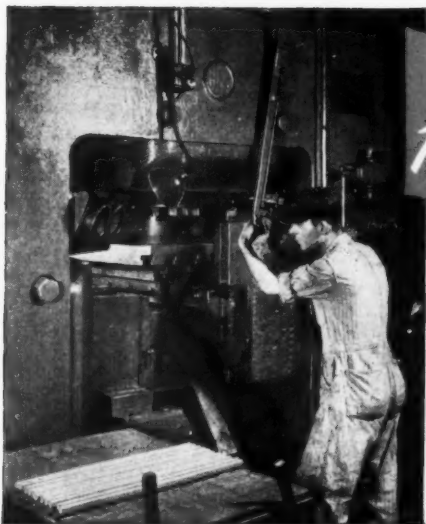
**Involute
Spline
Broach and
part of
Wrench
being
Broached for
Aircraft
Engine
Crankshaft.**



GREAT LAKES

Broach & Gage Company

1005 FRANKLIN STREET . . . DETROIT 7, MICHIGAN



Pressing a bar from powdered tungsten at Fansteel. After sintering, these bars are swaged to round and down to size, or rolled into the desired shape. Powdered metal also can be pressed into final "finished" forms.

PRESSING *Powdered Metal*

FOR IMPLEMENTS OF WAR...AND OF PEACE

The world will hear a lot about Powder Metallurgy in the days that lie ahead, for by this unique production method, metals which will not naturally alloy in the proportions desired, if at all, can be mixed in powder form and then made into strong, solid shapes by pressing and sintering.

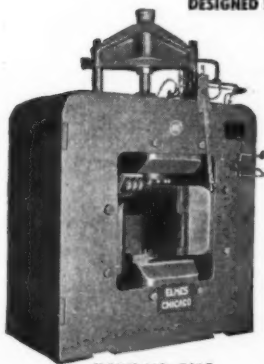
Such a pressing operation calls for the right type of equipment, for pressure must be both properly applied and accurately regulated. At the Fansteel Metallurgical Corporation of North Chicago, for example, six different grades of tungsten differing only in physical structure are made on the same 1000-ton Elmes powdered metal press.

This Elmes press has delivered three years of dependable double-shift performance in the production of tantalum, tungsten, molybdenum and columbium—rare metals that serve America in war as in peace.

Put your pressing problems up to Elmes. Suggestions and recommendations reflect nearly a century of progress in building and applying hydraulic equipment. Elmes Engineering Works of American Steel Foundries, 244 N. Morgan St., Chicago 7. Also manufactured in Canada.

DESIGNED FOR UNIFORM DENSITY IN COMPACTED SHAPE

The 1000-ton Elmes press. Two slides, one above the work and the other below, can exert full press pressure at same time. Hydraulic equalizing assures a definite travel ratio regardless of resistance or pressure. Mold sides open hydraulically to facilitate removal of compacted bar.



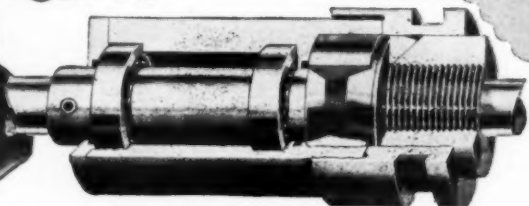
MODEL NO. 5685

ELMES HYDRAULIC EQUIPMENT

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES



THIS **Hanson** **TYPE "M"** IS THE PERFECT **FRICTION CLUTCH**



Hanson Friction Clutch Type "M" embodies all the principles which make a perfect friction clutch. This clutch, owing to the powerful wedge action and gradual contact of moving parts allows the easiest action

and greatest power transmission ability of any Friction Clutch of like size on the market.

Entirely cylindrical, perfectly balanced, so compact it has practically no speed limitations. Can be adjusted to absolute uniformity by single adjustment provision. This Type "M" may solve your clutch problem. Why not write us today for complete details.

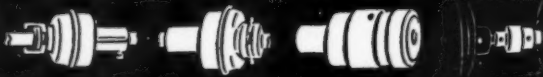
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A REQUEST ON YOUR LETTERHEAD
TODAY WILL BRING YOU A
COMPLETE HANSON CLUTCH
CATALOG OF ALL MODELS.



The Hanson Clutch & Mchy. Co.
BOX H-44 TIFFIN, OHIO

HANSON *Friction Clutches*

for every clutch requirement, regardless of load or drive speed.



How many machine tool operations help to make him

the safest flyer in the world . . .

America spends more time, more money, more effort to protect the life of a flyer than any other country in the world . . . He is the unexpedient.

Into a single engine of his plane go as many as 84,000 individual manufacturing operations . . . to accuracies as fine as four-millionths of an inch.

And of all the machine tools in use by the aviation industry, none is more basic or more vital than the internal grinding machine.

Bryant engineers have helped the men of government and of industry to plan the most desperate and gigantic production program of all time . . . and they can help those same men in planning today for the peace that must be won after the war is won!

We invite you to send for a Bryant man today.

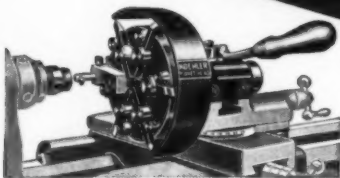


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CHUCKING GRINDER CO.
SPRINGFIELD, VERMONT, U. S. A.



KOEHLER . . . CONVERSION TOOLS for LATHES



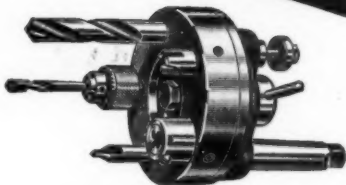
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KOEHLER TURRET HEADS

machine your inside and outside operations in one setting, assuring concentricity and accuracy on production work.

Tolerances of .0005" easily maintained.
MODEL A — 6 TOOLS for 9"-12" Lathes,
\$85.00.

MODEL B — 8 TOOLS for 12"-20" Lathes,
\$100.00.



KOEHLER TAILSTOCK TURRET

Especially designed for clearance so that the use of this TAILSTOCK TURRET does not interfere with the proper action of our Turret Heads or other tool post turrets now in use.

TAILSTOCK TURRET with No. 2 or No. 3 Morse Taper, \$45.00.



KOEHLER CARRIAGE STOPS

eliminate errors on shoulder and internal work. Accuracy to within .0005" on production is easily held.

MODEL A — 6 Positions, \$20.00.

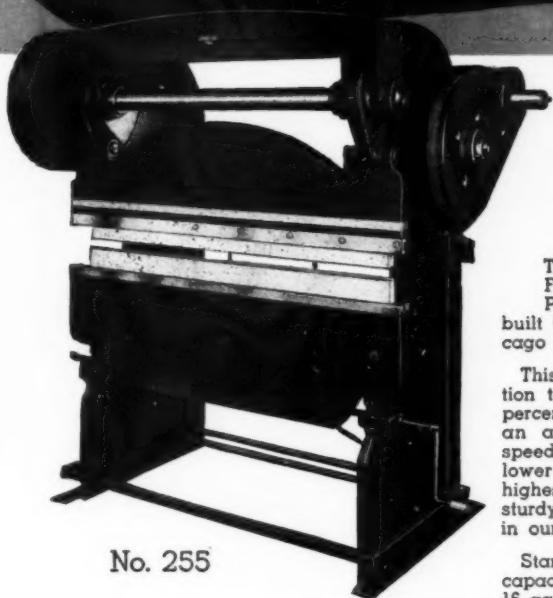
MODEL B — 8 Positions, \$27.50 to \$32.50.

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FOLDER

Buy direct or through your dealer. Attractive discount to dealers. Territories open.

KOEHLER TOOL DIVISION 168-56 Douglas Ave.
Jamaica 3, New York

Powerful CHICAGO STEEL PRESS BRAKE



No. 255

We also build special machines for intricate bending operations.

Take advantage of our experience of over 40 years by sending to us any difficult bending problem you have.

This No. 255 is a **POWERFUL**, rugged, inexpensive Press Brake, designed and built to the standards of Chicago Steel Forming Presses.

This money-saving production tool will handle 40 to 50 percent of the work done in an average shop. Greater speed, higher efficiency—much lower operating cost—plus the highest quality material and sturdy welded construction as in our larger machines.

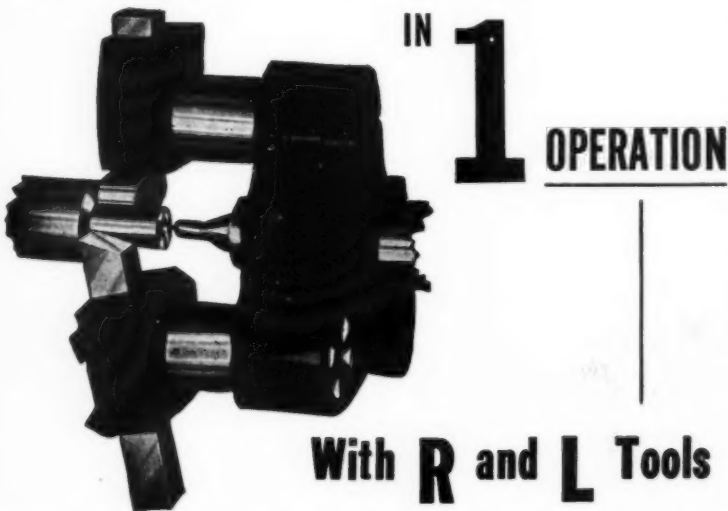
Standard Series—3 sizes—capacities 14 gage, 4 ft. long; 16 gage, 5 ft. long; 18 gage, 6 ft. long.

Heavy Duty Series—3 sizes—capacities 10 gage, 4 ft. long; 12 gage, 5 ft. long; 14 gage, 6 ft. long. Powered by $\frac{3}{4}$ to $1\frac{1}{2}$ h. p. motors.

**WORLD'S LARGEST MANUFACTURER OF HAND BENDING,
POWER BENDING AND POWER PRESS BRAKES**

DREIS & KRUMP MANUFACTURING CO.
7440 LOOMIS BLVD., - - - CHICAGO, ILL.
SEND FOR NEW BOOK "FORMING PRESS DIES AND THEIR USES"

Turning *AND* Centering



This Combination Tool is the only Right and Left Hand tool on the market. Can be changed from right to left and vice versa in 10 seconds. Replaces 14 tools costing 4 times as much.

Here are some of the multiple operations that can be done with the R and L: Pointing work concentric with turned diameter; drilling and chamfering; turning and forming special shape or end of part while drilling or reaming; turning one diameter—chamfering two corners, facing end of part along with drilling or reaming; turning two diameters while drilling or reaming; turning shoulder concentric with stock diameter.

You can readily see the enormous savings in time, trouble and money that can be effected by the use of R and L Turning Tools.

Write for 44-page booklet describing all the uses of R and L.

R AND L TOOLS

1827 BRISTOL ST.

NICETOWN, PHILADELPHIA, PA.



For a Prosperous Peacetime America...

BE READY WHEN RECONVERSION COMES!

TOOLING has always been one of Industry's major problems. When Peace returns, this may well be one of the real bottlenecks at a time when the Nation's greatest need is maximum employment in civilian production.

May we earnestly suggest that consideration be given to the future retooling needs of YOUR PLANT. We invite you to get acquainted with us NOW—so that we may be in a posi-

tion to provide speedy assistance when this problem arises.

Investigation will show you that we are competent and equipped to give you a COMPLETE service of engineering and production on any type of special tool problem, and to COMPLETELY TOOL UP YOUR PLANT.

The same "Know How" and pioneering spirit which enabled us to successfully accomplish the mass production of precision inspection gages

for War, will be used to engineer maximum production capacity into the tools of Peace.

For information, without obligation, write to us at the address below.

Stay with It... Buy War Bonds

QUALITY TOOL & DIE CO.

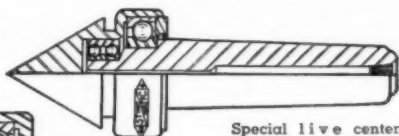
Manufacturers of "Quality" Products

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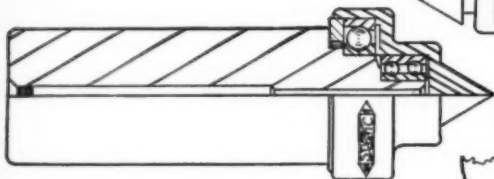


Special Live Centers

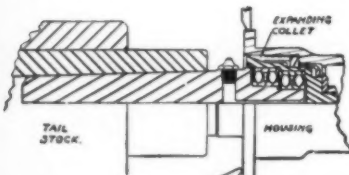
Send us your specifications and blue-prints — We will see that your job is set up with the right LIVE CENTER.



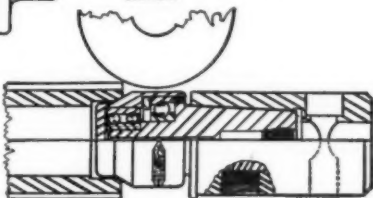
Special live center used for turning various sizes of tubing, pipe, etc.



Special live center used in Warner & Swasey screw machines.

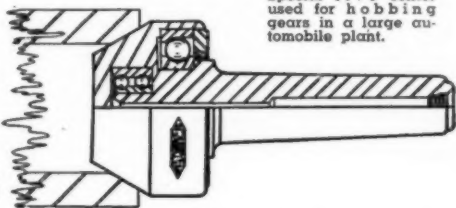


For turning and facing rear axle housing, tubes on a center drive lathe using a live center on each end, machining both ends simultaneously.



Special live center used for hobbing gears in a large automobile plant.

Special live center for turning extra large tubing.



Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action . . . that compensates for expansion due to heat, shock and excessive thrust loads — reducing wear to a minimum. A properly engineered live center is one of the fundamentals of setting up a job and requires a specialist's experience . . . standard shanks with Morse taper carried in stock — prompt deliveries on high priorities.

STURDIMATIC

TOOL COMPANY

5224 THIRD AVE. DETROIT, MICH.

WAR-PROVED WAYS TO *Improve* PRODUCTION

Here's a war-proved way to *improve* your production—do the job faster and better with ARO Pneumatic Tools!

Designed with tremendous power in a surprisingly small unit, ARO Tools get more work done with less fatigue! Unbeatable for drilling, grinding, baring, filing, screw-driving, nut-setting and many other small tool operations. Ruggedly constructed—simple in design—dependable. Write for new catalog No. 44.

The Aro Equipment Corporation, Bryan, Ohio.

Specify **ARO** PNEUMATIC TOOLS



DRILLING—Sturdy, light in weight, powerful... ARO Drills up to $\frac{1}{2}$ " capacity.



GRINDING—Turbine Grinder for fine finish work. 75,000 R.P.M.



NEW IMPACT WRENCH—Controlled torque eliminates stretching, stripping or "burning" in nut-setting or screw-driving.



BURRING—Simple, stall-proof...for scores of burring, grinding, and filing operations.

SLIP ROLL FORMING MACHINES

**POWER-DRIVEN — NEW TYPE
4" DIAMETER**



Early Deliveries Available

This sturdy former is of the latest improved design ruggedly constructed for heavy-duty service. The slip roll feature makes it easy to remove formed materials from the machine.

The rolls are of tough steel, turned and polished. Bottom and backup rolls have circular grooves for forming work with outside wire edges.

All machines are supplied complete with motor and drum type reversing switches. Sizes range from 38" to 98" roll length and will be furnished with all three rolls power driven if desired.

Heavier motor-driven machines are also available either in initial or pyramid type. We can also furnish lighter hand-powered bench and floor type machines. Let us send you descriptive literature.

SAN ANGELO FOUNDRY & MACHINE COMPANY

SAN ANGELO, TEXAS, U. S. A.

"Dealers in Principal Industrial Cities"

NOT ONE-BUT TWO

major developments in gage block manufacture



What do these improvements mean to you?

These FONDA "Ultra-Finish" gage blocks are processed to such extreme surface smoothness and accuracy that they require no oil or other film for wringing. No peaks to wear off and reduce block size...no films between stacked blocks to introduce other errors. Faster wringing! Longer wear! And safer, surer protection for your production accuracy standards.

It means that you can obtain—at no premium on price—the same fine-precision FONDA gage blocks such as are used constantly by the National Bureau of Standards and leading laboratories, for sustained high accuracy in critical measurements.

Prompt Deliveries

FONDA GAGE COMPANY

STAMFORD, CONNECTICUT

Agents in All Principal Cities throughout the World



PASSED
HIGHEST TESTS
DEvised BY THE
NATIONAL BUREAU
OF STANDARDS

For a helpful summary of new modern developments in gage block manufacture, write for BULLETIN #

FONDA *Gage Blocks*

ALSO FONDA PRECISION GAGES:
Dial, Plug, Ring, Snap, Profile, Flush
Pin, etcetera...all types except
Thread gages.

Heat Treat

Your Own Small Parts...

SAVE TIME AND MONEY THESE 5 DIFFERENT WAYS

This small compact electric furnace is inexpensive, handy and easy to operate—ideal for small tool and die shops—saves time these five different ways:

- 1 Eliminates delays in sending small machine parts out to overcrowded commercial heat treaters.
- 2 Saves time and expense of drawing or tempering small metal parts in large furnaces.
- 3 Cuts handling time when normalizing or annealing small parts. No waiting.
- 4 Conveniently available for pre-heating for subsequent high-speed hardening.
- 5 Eliminates shut downs and delays in servicing emergency repair orders.

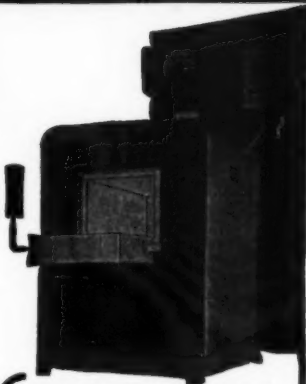
AVAILABLE IN TWO SIZES

Type	Chamber Capacity	Amps 115 V	Watts	Amps 230 V	Prices
MH-3	8"W 6"H 14"L	29.6	3400	14.8	\$124.00*
MH-4	10"W 6"H 18"L	—	4800	20.9	\$191.00*

*Includes Hearth Plate

MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—\$152.40.



REPLACEABLE HEATING ELEMENTS—Replaceable nickel chromium resistors embedded in rectangular refractory blocks. Elements form inner walls of furnace chamber, and may be replaced easily and quickly after removing rear panel—furnace structure remains undisturbed.

FREE Complete data covering specifications, additional applications and ordering instructions are included in this new folder.

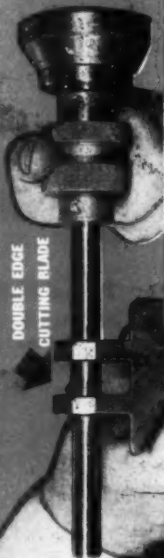
Write for your copy today. Ask for Bulletin No. 50.



COOLEY ELECTRIC MANUFACTURING CORP.
36 SOUTH SHELBY STREET • INDIANAPOLIS 7, IND.

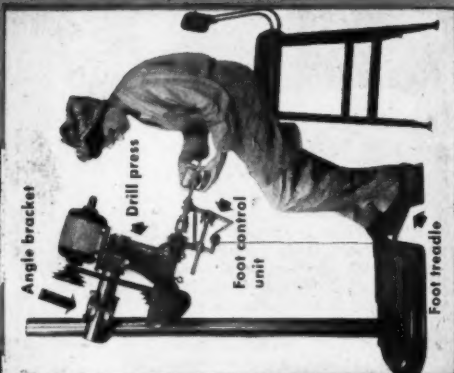
HERE'S HOW TO QUICKLY REMOVE THE BURRS LEFT BY CUTTING TOOLS AROUND THE EDGES OF HOLES ON MACHINED AND SHEET METAL PARTS!

DOUBLE EDGE
CUTTING BLADE



You can remove these sharp jagged burrs **FASTER** with NOBUR than by any other method! Simple and easy to use, NOBUR works like a drill — placed in the spindle of any machine tool, burring may be done by untitled help with complete ease and safety — and as rapidly as parts can be handled. NOBUR eliminates slow, costly hand work. The double-edged cutting blade is of high speed steel and cuts freely in either alloy steels or soft metals.

Write for the complete story of burring this never, faster way — NOW!



New Nobur foot control greatly speeds Nobur-ing! Quickly installed on any popular type of drill press, this inexpensive accessory leaves both hands for rapid handling of work. The mounting bracket provides adjustable positioning of spindle to operator's best working position.



NOBUR MANUFACTURING COMPANY
910 North Orange Drive, Los Angeles 38, California

"BASIC UNIT+PARTS" PLAN

Gives you EXACTLY the High Speed Production Lathe you need — at Lowest Cost



(LEFT) BASIC UNIT OF THE MINNEAPOLIS PRODUCTION LATHE to which you can add only the equipment needed for your particular production "set-up". 4 different drives.



Special set-up speeds up brake band production.

(RIGHT) A SET-UP "TAILOR-MADE" FOR CUSTOMER'S NEEDS

A delivery bottle neck was broken by machining 3 brake band segments at a time with this special arrangement of Minneapolis Production Lathe. Special face-plate holds 3 segments. Counterbalanced loading fixture mounted on carriage is swung back for refill while lathe is operating.

SMALLER INVESTMENT — Lower Production Costs

The "MINNEAPOLIS" Production Lathe is extremely adaptable to any production set-up, particularly second operation work. Its simplified design and ease of control enable inexperienced operators to turn out high speed volume production.

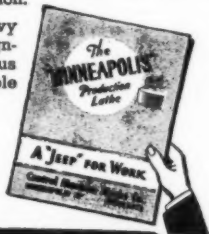
The "MINNEAPOLIS" has 2 1/4" collet capacity, 14" swing, heavy duty spindle assembly. It is backed by more than 50 years designing and manufacturing experience. Send for literature — write us your production problems. Send sample part or drawing if possible — let us quote you on a "tailor-made" lathe for your work.

CENTRAL MACHINE WORKS CO.

Machinery designers and manufacturers since 1890

1225 Central Avenue,

Minneapolis 13, Minnesota



THIS AIRPLANE MANUFACTURER
SPEEDS PRODUCTION
 WITH THE HELP OF
SKILSAW!

All action photos from
 CURTISS-WRIGHT CORPORATION
 AIRPLANE DIVISION—ST. LOUIS PLANT

In this special jig... SKILSAW speeds
 the cutting of aluminum for fuel tanks

• This demonstration of SKILSAW's extra speed, power and versatility is one more example of how SKILSAW helps manufacturers boost war production. A big job gets done *hours faster* when a leading aircraft maker puts SKILSAW to work on an important part of the operation. So it goes in busy plants everywhere... SKILSAW does a better cutting job faster and easier... in a jig or freehand... on a variety of materials.

SKILSAW is a marvel of compactness, light weight and handling ease. It goes right to the job, saves material handling, saves time, saves manpower and money. Phone your distributor today for a demonstration.

SKILSAW, INC.

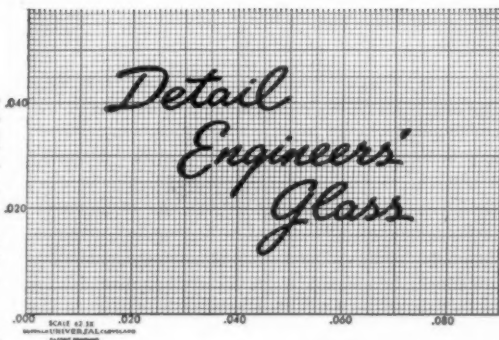
5033-43 Elston Ave., Chicago 30, Ill.
 Sales and Service Branches in All Principal Cities

SKILSAW PORTABLE ELECTRIC **TOOLS**
 MAKE AMERICA'S HANDS MORE PRODUCTIVE

- (above) SKILSAW quickly cuts double thickness of aluminum while no workman moves workpiece.
- (below) Inspection shows smooth, close cut made by SKILSAW before welding operation.

Your IDEAL GUIDE in making Precise Charts for your OPTICAL COMPARATORS, OPTICAL PROJECTORS, SHADOWGRAPHS

... gives you graph-like, machine ruled transparent blue lines combined with Translucent Engineers'-Glass and solves your problem of a medium on which to easily, quickly and accurately draw diagrams to the desired scale.



The lines of blue actually are ruled on the glass, so they cannot change from their original precise spacing. Translucent vellum is cemented onto the surface of the glass directly over and in contact with the ruled lines.

Your accurate layouts can be drawn on the vellum, by the aid of these lines, with either pencil or pen. You can make erasures time and again if alterations are desired, yet the blue lines will remain as clear as before.

Your layouts may be repro-

Section of 62.5x Detail Engineers'-Glass, one half actual size. Magnifications of 10x, 20x, 25x, 31.25x, and 50x also available.

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Detailed Engineers'-Glass, Scribing, is also available—in the same magnifications as Detail Engineers'-Glass, Translucent. Your scribing can be made at the desired magnification without mathematical computation.

For complete descriptions write for your copy of Bulletin DEG-11-44. It also introduces a series of highly desirable Grid Charts for Optical Projectors.

ENGINEERS SPECIALTIES DIVISION

Of the UNIVERSAL ENGRAVING & COLORPLATE COMPANY, INC.

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BUFFALO 8, NEW YORK

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1919 EAST 19th STREET
CLEVELAND 15, OHIO

*Fifteen of the Leading Steel Makers
in this Country and Canada use the
MO-MAX Formula in producing their
Trademarked Brands of High Speed
Cutting Tool Steel...and*

"LMW"	Allegheny Ludlum Steel Corp.
"Mohican"	Atlas Steels, Ltd.
"Bethlehem HM"	Bethlehem Steel Company
"Mo-Cut"	Brasburn Alloy Steel Corp.
"Star Max"	The Carpenter Steel Co.
"Molite 8"	Columbia Tool Steel Company
"Rex-T-Mo"	Crucible Steel Co. of America
"D-Mol"	Henry Duxton & Sons, Inc.
"Rex-T-Mo"	Malcomb Steel Co.
"Moqu"	Tessco Steel Company
"Tatmo"	Lafayette Electric Steel Co.
"S. T. M."	Simonds Saw and Steel Co.
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MO-MAX Molybdenum-tungsten high-speed steel was the first commercially successful Moly High Speed steel. Through eleven years of service, it has proved to be highly efficient, surpassing the old standard 18-4-1 High Speed Steel. Twenty thousand tests show 20% more work per grind and per tool.

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6355

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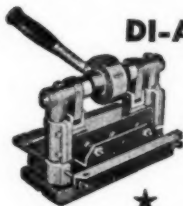


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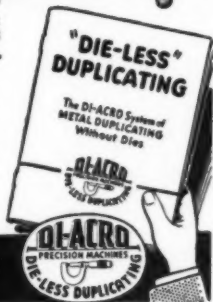
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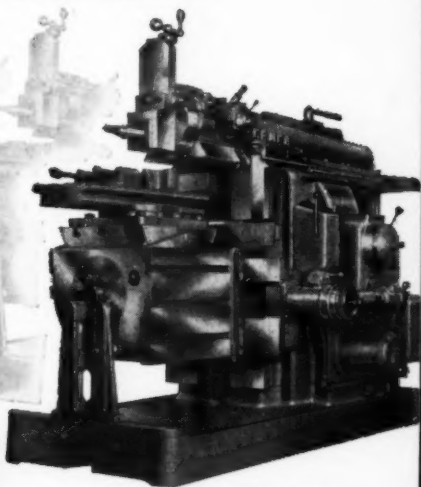


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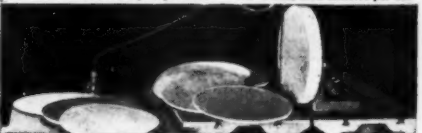
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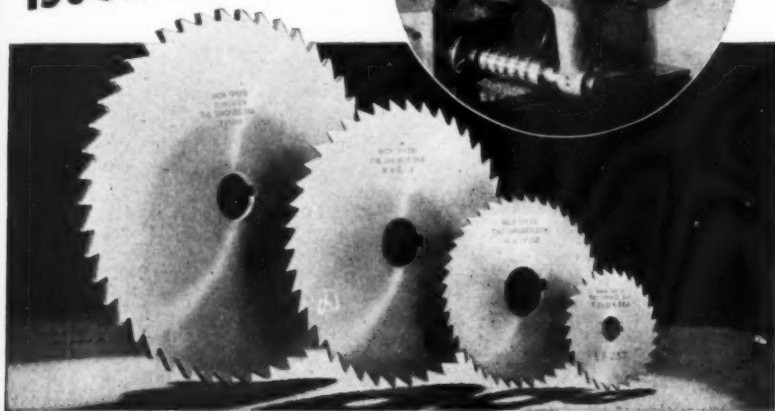
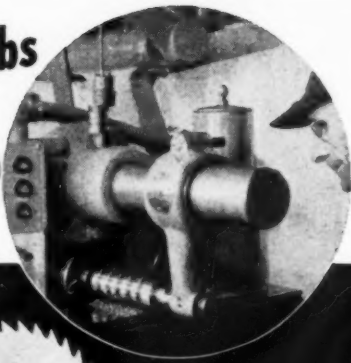
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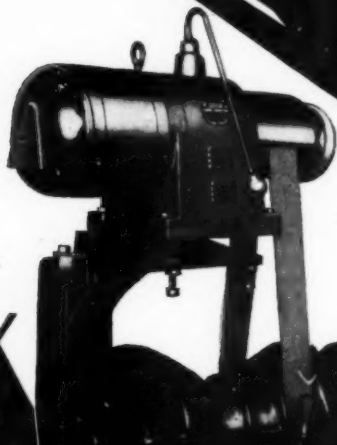


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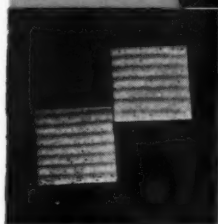


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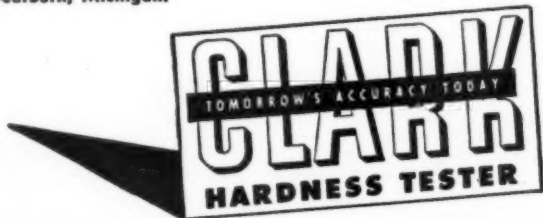


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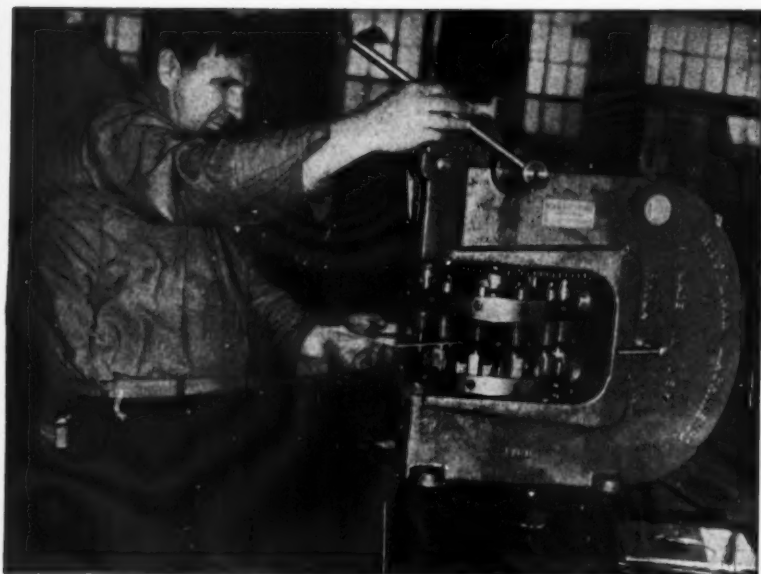
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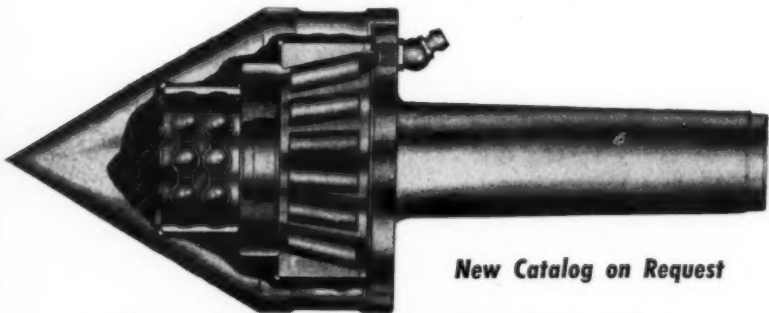
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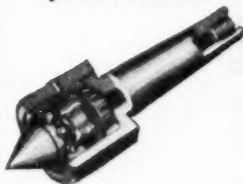
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SIZE	PG 01	PG 1	PG 2	Coat Grnd	Cut Thr	SIZE	PG 01	PG 1	PG 2	Coat Grnd	Cut Thr
1/4-20 2 flute	X		X			9/16-12 4 flute	X	(X)	(X)	(X)	
3/8-16 2 flute		X				9/16-18 4 flute	X	X	X	X	X
1/2-13 2 flute	(X)	(X)	(X)	(X)	(X)	5/8-11 4 flute	X	(X)	(X)	(X)	(X)
5/16-18 2 flute	X	X	X	X		5/8-18 4 flute	X	(X)	(X)	(X)	(X)
3/8-16 4 flute	(X)	(X)	(X)	(X)	X	1 1/8-11 4 flute					
5/16-18 4 flute		X				1 1/8-16 4 flute					
3/8-16 4 flute	(X)	(X)	(X)	(X)	(X)	2 1/8-11 4 flute					
5/16-24 2 flute											
3/8-16 2 flute	X	X	(X)								
5/16-18 2 flute	(X)	(X)	(X)								
3/8-24 2 flute	X	X	(X)								
5/16-24 2 flute											
7/16-14 4 flute	X	(X)	(X)	(X)							
7/16-20 2 flute	X	X	(X)	(X)							
1/2-13 2 flute	(X)	(X)	(X)	(X)	(X)						
1/2-20 2 flute	(X)	(X)	(X)	(X)	(X)						
1/2-20 4 flute	(X)	(X)	(X)	(X)	(X)						

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SIZE	PG 01	PG 1	PG 2	Coat Grnd	Cut Thr	SIZE	PG 01	PG 1	PG 2	Coat Grnd	Cut Thr
1/4-20 2 flute	X	(X)	(X)	(X)		7/16-14 3 flute	X	(X)	(X)	(X)	
1/4-28 2 flute	(X)	X	X	(X)		7/16-20 3 flute	X	X	(X)	(X)	X
5/16-18 2 flute	(X)	(X)	X	X	X	1/2-13 3 flute	X	X	X	X	
5/16-24 2 flute	X	X	(X)	(X)	X	1/2-20 3 flute	X	(X)	(X)	(X)	
3/8-16 3 flute	X	(X)	(X)	(X)	X						
5/8-11 3 flute	X	X	X	X	X						

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HY-PRO TOOL CO.

New Bedford, Mass., U.S.A.

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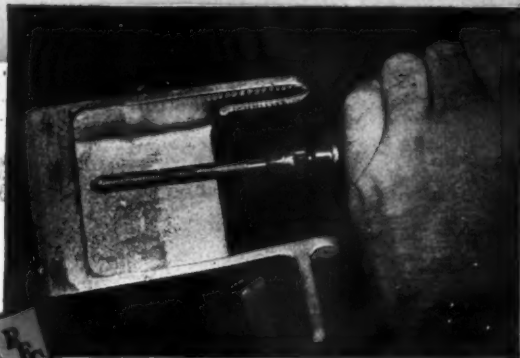
BORN WITH *Upper* AND *lower* SETS



Its lower set of teeth bite rapidly into a small casting. Then it uses the upper set to neatly chamfer the casting. This RFC HAND-CUT ROTARY FILE—illustrated at the left—is no more remarkable, however, than many of its brothers among the RFC special shapes.

The RFC is an interesting family of rotary files ... standard or special ... in high speed steel or high carbon steel. The hundreds of plants that have adopted them class them among the "best little workers in the factory." They come in all shapes and sizes. Unsurpassed for precision and speed—even in hands not the most skilled.

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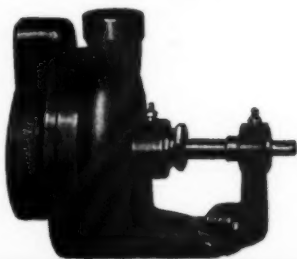
Coolants Maintain Even Flow with FULFLO COOLANT PUMPS

Important to know . . . and just as important in practice these days (and nights) of almost constant, unflagging use . . . when machines are doing so much to win wars in every land and on sea.

FULFLO COOLANT PUMPS are obtainable with right or left rotation; direct, belt or motor drives. Master motors with special patented seal. Pipe sizes $\frac{3}{8}$ " to $1\frac{1}{2}$ ".

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Illustrated is Model FRS4.



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BLANCHESTER, OHIO

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GONE FOREVER—battered and damaged die sets caused by prying or hammering. **ACRO DIE SET PULLERS** do the job the **FIRST** time. No Delay. Use **ACRO PULLERS** for safe sure separation. They are fast—accurate—positive. War plants using these pullers report savings as high as 50% in time alone.

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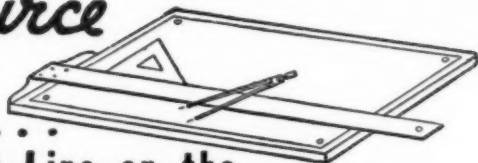
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production itself. We work
from rough idea. Part
print — sketch — or just
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Tools — Dies — Jigs —
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1101 and 1925 W. Main St., SPRINGFIELD, OHIO
ENGINEERING • DESIGNING • DEVELOPMENT

BRAZING CARBIDE TOOL TIPS WITH EASY-FLO No. 3



BULLETIN 11-A

Brazing resistant carbide tips to tool shanks with EASY-FLO No. 3 is not new. It is the accepted, time-tested way of doing the job - and is widely recommended by leading carbide tip manufacturers. Use it confidently for tipping all tools except those on which excessive cutting heat is generated.

WHY EASY-FLO No. 3 IS FAVORED FOR CARBIDE TIPPING

1. Its low working temperature of 1270° the danger of overheating the tool shank tip oxidation low.
2. Its free-flowing property helps cause "wetting" of joint surfaces.
3. When properly applied, it makes hold for the life of the tool - the tip up before the base.
4. It is economical as well as fast, temperature and easy flowing minimizes cost.
5. It permits ready removal of us and re-use of shanks.

Send for this "HOW TO" bulletin on Tool Tipping

In simple, concise form, this new bulletin covers the widely accepted EASY-FLO No. 3 method of mounting carbide tool tips.

It explains why brazing with the low temperature silver alloy EASY-FLO No. 3 is so fast, reliable and economical.

It gives a step-by-step "picture and word" explanation of how to do a tool tipping job that is clear and easy to follow.

The bulletin also covers the procedure for mounting high speed steel tips with the regular EASY-FLO alloy.

If you are in any way interested in tool tipping, you should have the valuable information offered in BULLETIN 11-A. We'll be glad to send you a copy on request. Write for it today.

HANDY & HARMAN



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Sizes shown here are 1/4"
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diameter — all high speed
steel.

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SLOTING SAWS
MICA UNDERCUTTING SAWS**

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Are Doing a Big Job!

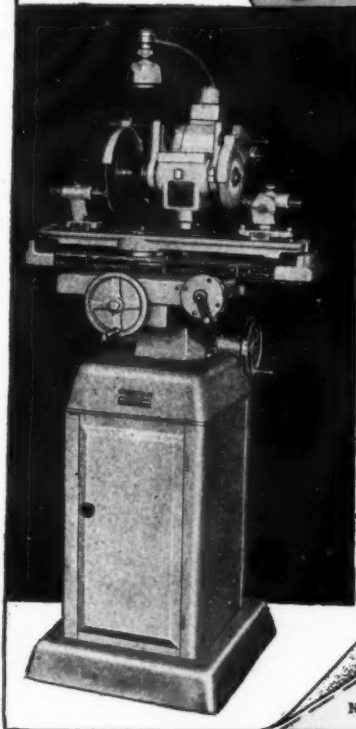
The Circular Tool Company, one of America's largest manufacturers of these types of saws which are today "doing a big job" wherever electrical motors for automotive, air and marine use are produced, also offers a complete line of specialized metal cutting saws built by perfectionists for today's and tomorrow's exacting operations.

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PROVIDENCE 5, R. I.

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 NINE OPERATING SPEEDS
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Illustrative literature just off the press is now available for the asking. Fifty-two operating pictures, latest improvements in tool grinders. Many time saving grinding fixtures that are adaptable to any make tool grinder.

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DRILL WITH AIR

Easy as pointing your finger



Length—5-7/8"
Outside dia.—1-9/16"
Weight—1-15/16 lb.

It's natural to locate a spot by pointing. It is just as easy to drill with the air-powered Series 00A because it is built to fit the hand and weighs less than two pounds.

The small size of the "00A" is made possible by a compact "Multi-Vane" type air motor. All rotating parts are supported by high-grade ball bearings, which reduce friction losses. The handle contains a speed regulator for easy control of power and also a built-in lubricator. Reliable service and longer tool life are assured as the air motor does not heat up under any operating conditions and cannot be injured by overloading.

The extremely short over-all length (57/8") and small outside diameter (1 9/16") makes this tool particularly useful in very limited quarters where small, high power drills are essential.

The following gear ratios are available, each drill having the same dimensions as indicated above.

Size 00AH is suitable for extremely light high speed drilling in aluminum and other soft metals. Speed is 15,000 r.p.m.

Size 00AJ is suitable for drilling up to 1/8" in steel and for slightly heavier service in soft metals. Speed is 4500 r.p.m.

Size 00AK is suitable for drilling up to 3/16" in steel and slightly heavier service in soft metals. Average working speed is 2500 r.p.m.

Ingersoll-Rand

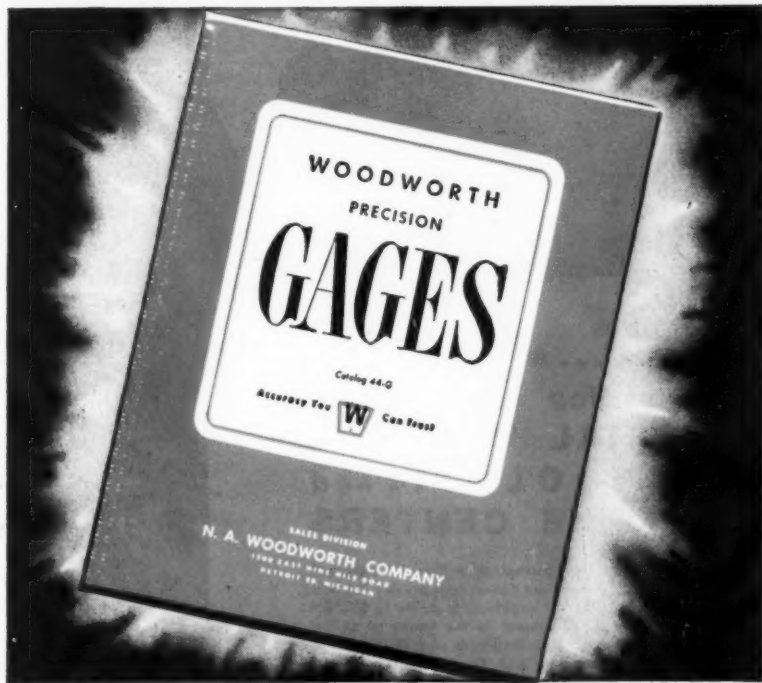
11 BROADWAY, NEW YORK 4, N. Y.



Size 00AK drilling 3/16 inch hole

B-421

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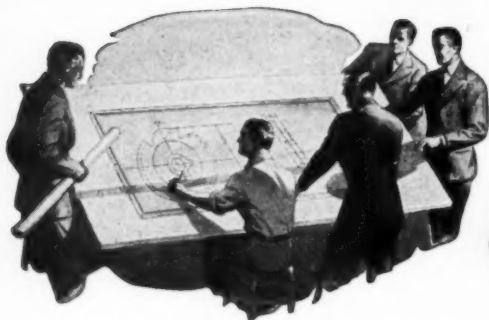
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*MOTOR TOOL LIVE CENTERS may also be ordered in STANDARD shapes and sizes. Morse Tapers (1 to 7 Inclusive) carried in stock. Other shanks and tapers available on order.



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*Make it a Rule
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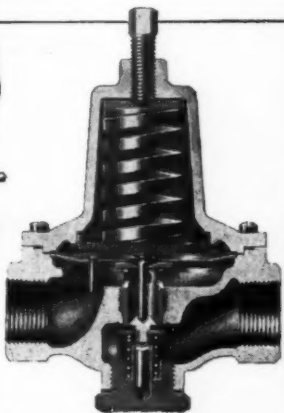


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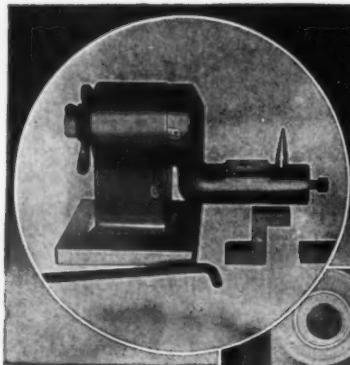
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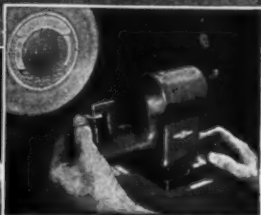
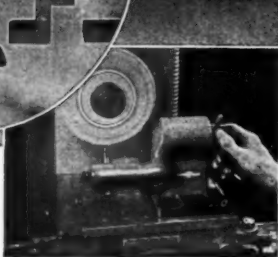
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Base of radius dresser is machined parallel to center line of swivel arm. Sets against straight edge of magnetic chuck.



Diamond set to gage block accuracy.

The American Radius Dresser is a sturdy, compact, precision-built grinding fixture. Simplifies the process of dressing grinding wheels to gage block accuracy. Is quickly set; dresses concave or convex radii up to 1" on grinding wheels up to 7½" diameter.

Wheel is dressed in same position as work is ground. Z-shaped set-up block is clamped to swivel arm and removed after diamond has been set with gage block for correct radius.

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Very reasonably priced. Delivery from stock. Get complete details and prices. Send for Bulletin 43-BB.

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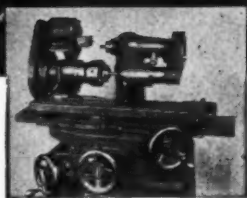


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125 Bayard St. DAYTON 1, OHIO

ROTOREX UNIVERSAL GRINDER



Cylindrical grinding.



Internal grinding.



Sharpening a Helical Cutter.

For Sharpening and Production

PRECISION BUILT to perform two jobs—Production work such as cylindrical and internal grinding and sharpening of all kinds of tools.

The keynote of the Rotorex is simplicity, accuracy and flexibility.

Compact and simple in design with a minimum number of working parts in conjunction with conveniently located controls.

Precision built for sustained accuracy because of good workmanship.

The variety of work it handles is attained by a wide range of attachments for faster set-ups. Selective speed range from 3000 to 6000 RPM.

Write today for our new free catalogue with complete information on how the Rotorex can help you in your particular job.



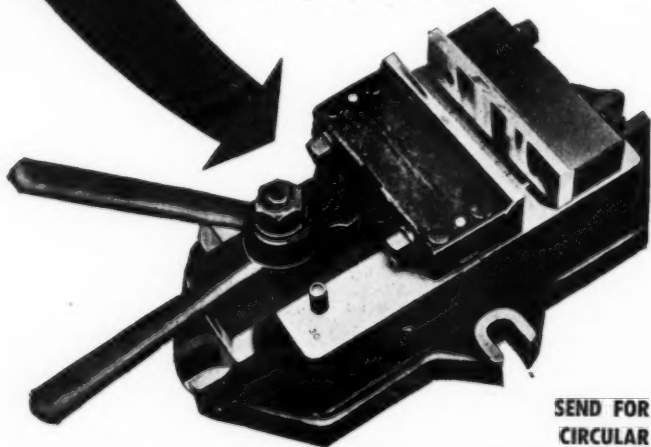
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156 Broadway, New York 7, N. Y.

The **HARTFORD** *Quick Acting* **MILLING VISE**

Great gripping power . . . quick release . . . one hand operation and rugged strength . . . these are a few of the many advantageous features of the HARTFORD Milling Vise.

Construction of the movable jaw with ground fitting surfaces is such that single pieces may be held at either end of jaws without danger of distortion. This vise is particularly adapted to small arms or small part milling, in which precision and speed are essential. It is a thoroughly modern vise for modern production needs . . . and worthy of your investigation.



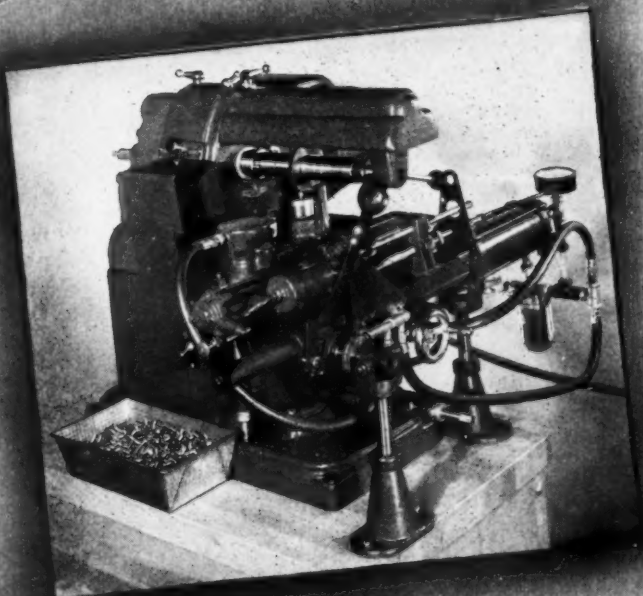
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IS A BUSY PLACE



Atlas milling machines equipped with Redmer Air chucks at Redmer Air Devices Corp., Chicago free operator's hands, increase production 43%.

"Imagination in engineering" so vital in winning the war will be equally valuable in peacetime production.

What happens when an ingenious engineer thinks of solving his problems with Atlas tools? The example above is typical of adaptations in hundreds of plants.

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4 *Atlas*
TOOL TEAM
FOR
SMALL-PARTS MACHINING



LATHES



MILLING MACHINES



SHAPERS



DRILL PRESSES

A Flexible, Adaptable Tapping Machine!

HANDLES A WIDE RANGE OF JOBS

In these quick-changing times a truly UNIVERSAL low-cost tapping machine is a real asset. The Proconier unit here illustrated, by interchanging two tapping heads will handle from a No. 2 tap up to a 5/16" tap in steel, 3/8" in cast iron and 1/2" in brass and aluminum. That means that in your shops one Proconier can do the work of two or more machines.

In addition, all adjustments can be made quickly and easily — such as regulating compensating spring pressure, setting depth stop, changing to any of the four speeds from 390 to 2050 RPM, or adjusting timing or flow of tap lubricant. Extra long compensating springs assure uniform tapping and reversing pressure independent of operator. Tap establishes its own lead for greater accuracy. Automatic tap lubricator provides abundant supply exactly when needed. Motor-driven continuous flow lubricant pumps also available. Has exclusive Proconier high-speed tapping head with double-cone friction clutch and TRU-GRIP tap holder which has many advantages. Many other features.

Prompt Delivery — Send for Bulletin

giving full details and prices on Proconier Universal Tapping Machines, High Speed Tapping Head and Tru-Grip Tap Holder.

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For Faster, More Accurate Tapping



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Send me bulletins on: ☐ High Speed Tapping Heads
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First to design milling cutters especially to fit the characteristics of Tungsten Carbide.
First to bring out a complete standard line of Tungsten Carbide milling cutters.
First to offer qualified engineering service in designing cutters for specific applications.

NOW First to design an inserted tooth cutter with characteristics of rigidity required for Carbide milling.
Available from stock in standard sizes.

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... close tolerance machine- **ERICKSON** Precision **RELATED TOOLS**

accuracy of .0005 guaranteed

The Erickson Precision Collet Chuck is outstanding for its super gripping strength and ability to maintain accuracy. Erickson Engineers regularly solve problems for many types of manufacturers anxious to improve results and profit by savings through proper handling of work. Uses and applications of the chuck to fit your requirements will gladly be recommended upon request.



THE
ERICKSON
COLLET

Collapses $\frac{1}{8}$ in.

ONE ERICKSON COLLET replaces at least **7 SINGLE PURPOSE COLLETS**



Erickson chucks on main and auxiliary turrets.



Models 102 and 402 on Automatic Screw Machine.



Model 202 Chuck on Hand Drill — 01 models generally used.



Model 102 holding woodruff Key Cutter on Horizontal Miller.



Model 502 Face Plate Chuck on Lathe—101 Chuck on Tail Stock.



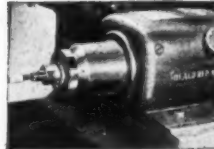
Tool Post Grinder equipped with Model 301 Chuck.



Drilling Operation showing No. 301 handwheel production Chuck.



Model 101 Chuck with auxiliary Tool Head.



Model 301 Stubbed Chuck designed for high speed internal operations.

ERICKSON STEEL CO. • Dept. D

ing operations always call for **COLLET CHUCKS and**

ERICKSON EXPANDING MANDRELS

An outstanding development in a method for securely holding parts on their interior surfaces for accurate machining to close tolerances. Furnished in both cantilever and between center models—in varying types and variations.



Between centers 1A1 Mandrel with lathe dog for driving.



4A1 Face Plate Mandrel-Series Type with Stop Locknut operated



2A1 Cantilever Mandrel. Morse Taper with tang.

ERICKSON FLOATING HOLDERS

POSITIVE - ADJUSTABLE

Adjusts up to $\frac{1}{16}$ inch to bring the accuracy and gripping strength of the Erickson Chuck to equipment where alignment is required.



Model 102 Floating Holder.

ERICKSON Precision TAPPING CHUCKS



A positive drive tap chuck offering for the first time accuracy in tapping and threading of holes.

◆ Erickson Tap Chuck on Warner & Swasey Precision Tapping and Threading Machine.

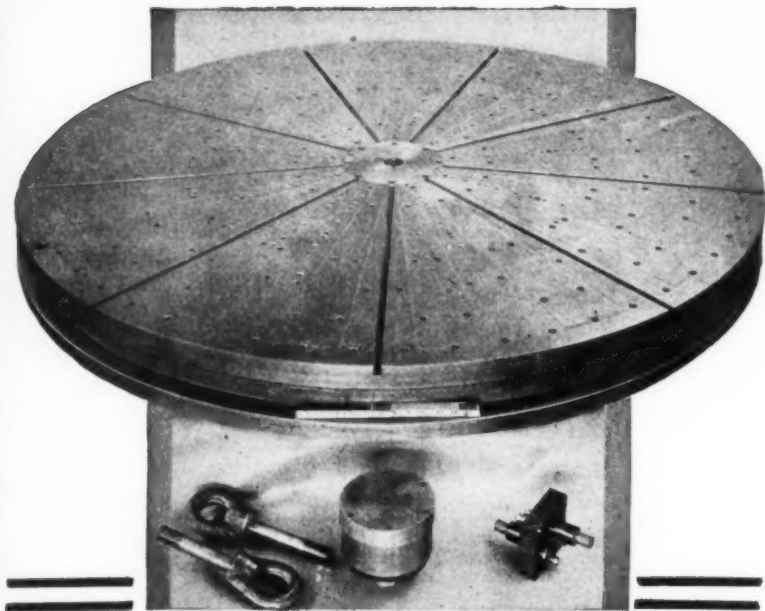
ERICKSON — The Chuck which grips on either flutes or shank of the drill.



Model U01 Tapping Chuck.

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NEW
BULLETIN
"F"**

2309 Hamilton Ave., Cleveland 14, Ohio, U. S. A.



66" All Steel Rotary Magnetic Chuck for use on a Niles Boring Mill type grinder to hold roller bearing races for inside and outside grinding.

A series of auxiliary rings provides for different diameters of work.

Specially built for Timken Roller Bearing Co., Canton, Ohio.

Approximate weight 5500 pounds. Watts used 2290.

Compare size with the 6" rotary chuck at bottom of photograph.

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WORCESTER, MASS. • U. S. A.

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LINE OF**

End Mills



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PUTNAM TOOL COMPANY

2983 Charlevoix Ave.

Detroit 7, Michigan

3 Lathe Operations

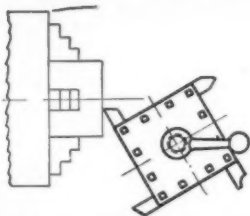
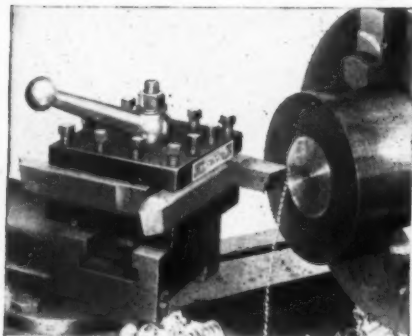


Photo No. 1— $\frac{3}{4}$ " square bit mounted in Model 4 $\frac{1}{2}$ -S turret used to face work. Same tool is indexed to position and used for turning as shown below.

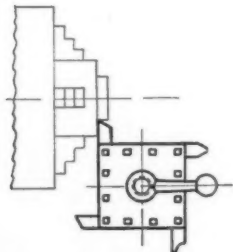


Photo No. 2—Side of tool is used to take a 1" deep broad-face cut.

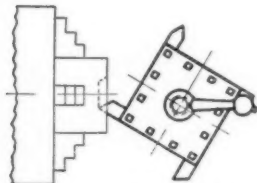
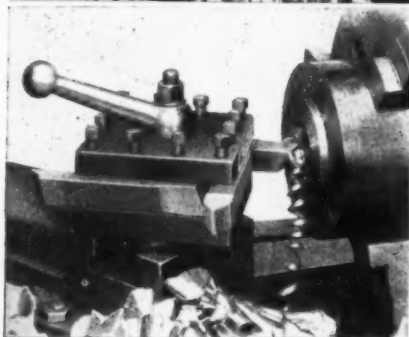


Photo No. 3—Same tool shown in photos No. 1 and No. 2 being used for inside chamfer.

ENCO. Mfg. Co.
CHICAGO 39, ILL.

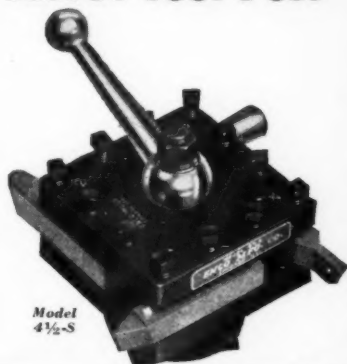
with ONE Tool...

Using ENCO'S New 12-Position Turret Tool Post

Here's an improved low-cost Turret Tool Post with *three* working positions instead of one for each tool. Turret block indexes at 30 degrees. Eliminates need for grinding special tools. Ordinary tools can be used as shown in illustrations at left. Saves time and increases tool capacity.

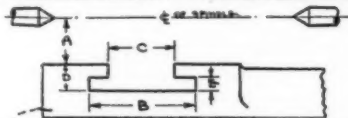
Also speeds production because turning, facing, boring, cut-off, threading and forming tools may be mounted in the turret block of your ENCO Turret Tool Post on your present engine or bench lathe. Fast action, positive indexing brings the next tool into position. Complete job can be set up at once saving valuable lost-time on second operation set-ups.

Turret keeps setting accurately. All models mount standard rectangular or square bits as well as standard cut-off blades and boring bars.



Model
4 1/2-S

"A" Dimension range (from diagram on this page)	Model 6-S	Model 4 1/2-S	Model 3 1/2-S	Model 2 1/2-S	Model H
Lathe Swing	2" — 3 1/8"	1-9/16" — 2-1/2"	1-1/8" — 1-3/4"	7/8" — 1-5/16"	7/8" — 1-5/16"
	16" swing & up	13" to 16" swing	10" to 13" swing	Bench Lathe	Bench Lathe
	1" or 1-1/4"	3/4" or 5/8"	1/2" Sq.	3/8" Sq.	3/8" Sq.
Maximum tool bit size	1-3/8" toolholder for 3/8" bit (Where no tool bit size is specified, tur- ret will be furnished for 1 inch tool bit)	(Where no tool bit size is specified, tur- ret will be furnished for 5-8 inch tool bit)			
SPECIFICATIONS	4 tool 12 position 6" square Packed in carton Shipping Weight 35 pounds Price. \$99.00	4 tool 12 position 4" square Packed in carton Shipping Weight 16 pounds Price. \$49.50	4 tool 12 position 3-1/2" square Packed in carton Shipping Weight 8 pounds Price. \$35.00	4 tool 12 position 2-1/2" square Packed in carton Shipping Weight 4 pounds Price. \$23.00	6 tool 12 position 3" Hex Packed in carton Shipping Weight 4 pounds Price. \$25.00



Note of Lathe and Size	A	B	C	D	E	Maximum tool size desired

IMMEDIATE DELIVERY

on Turrets for these lathes: Atlas, South Bend, Logan, Sheldon, Clausing

Also all models with machinable base on center post for quick adaption to your lathe.

One-week delivery on ENCO Turret Tool Posts made to specifications. When ordering, furnish all required dimensions and tool size desired and name and address of regular dealer.

ENCO MANUFACTURING COMPANY, Dept. 34

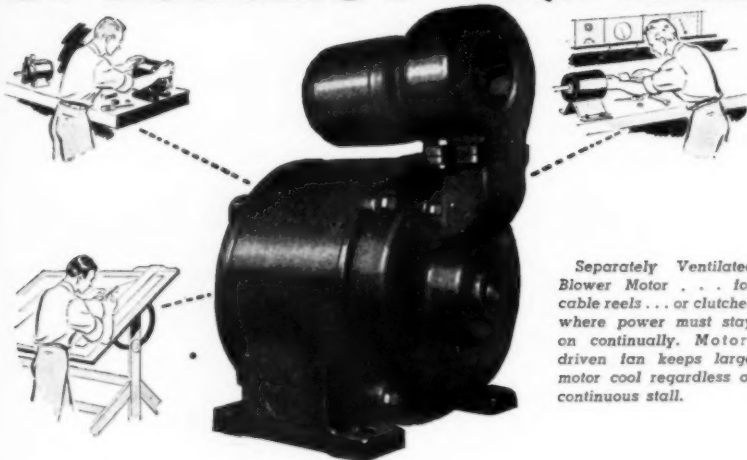
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SPECIALIST- OF SPECIAL TORQUE MOTORS



Separately Ventilated Blower Motor . . . for cable reels . . . or clutches where power must stay on continually. Motor-driven fan keeps large motor cool regardless of continuous stall.

There are literally thousands of Welco "Custom-built" motors in operation. Each one of these special motors is delivering dependable, low-cost service day in and day out . . . and doing it because it was built by the specialist of special motors, The B. A. Wesche Electric Company, for 35 years builder of "Custom-built" motors.

One of the most outstanding features of Welco Torque Motors is their "Uni-frame" construction. This provides for an easy change from A.C. to D.C. power or vice

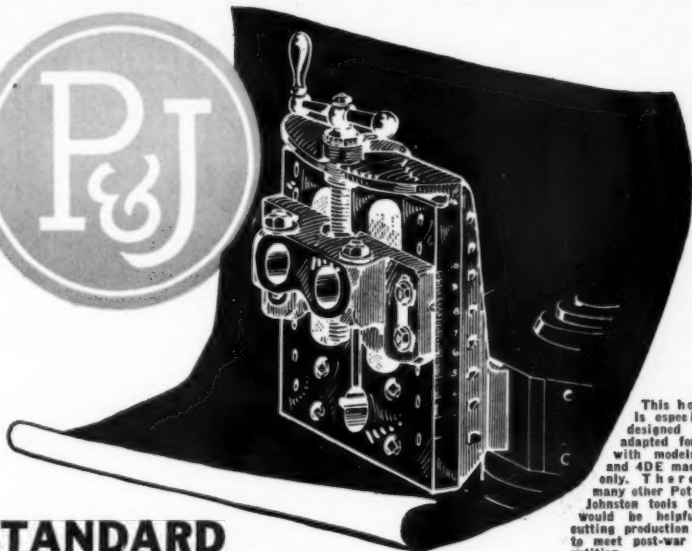
versa. However, only Welco Motors have this vitally important interchangeability.

Both the A.C. and D.C. Welco Torque Motors are built to exert torque up to 4000 inch pounds—just another development resulting from specialization in the difficult, the out-of-the ordinary applications of torque motors.

Write to Welco regarding your special powering problem. There is no machine powering problem too difficult for our engineers to solve.

THE B. A. WESCHE ELECTRIC CO.
1628 VINE STREET CINCINNATI 10, OHIO





This holder is especially designed and adapted for use with models 4D and 4DE machines only. There are many other Potter & Johnston tools that would be helpful in cutting production costs to meet post-war competition.

STANDARD ADJUSTABLE TURNING TOOL HOLDER

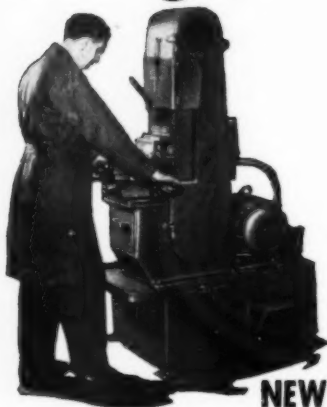
This adjustable tool holder will carry two Stems, either for turning or boring cuts, and in addition, a boring bar or drill may be carried in the center hole. The cutters are quickly set to the required diameters by moving the adjustable block up or down. The side scale and the micrometer dial under the ball crank contribute to quick and accurate settings which may be changed easily with the job. Two locking screws on either side of the block fix it solidly in the location desired. The adjustment range of the Stem holes is from 4 to 10" from the rotation center.

If you use Potter & Johnston machines in your plant, it will pay you to let us send you a copy of this catalog on modern tooling. It illustrates and describes a broad range of up-to-the-minute production tools.



The **POTTER & JOHNSTON**
MACHINE CO. PAWTUCKET, RHODE ISLAND

PORTER-CABLE *Wet Belt* SURFACING



- 5 to 25 times faster than many common methods.
- Removes metal and gives surface final finish at one operation.
- Requires much less metal on piece for machining.
- Holds to closer limits, often .0005"
- Generates true arcs, cuts exact bevels, cleans up burrs.
- Performs many operations without fixtures.
- Accomplishes the most exact operations with a simple jig.

NEW AUTOMATIC FEED MODEL

gives additional savings up to 42½% on loading time

LATEST FEATURES INCLUDE:

- Automatic Feeding to exact limit of cut.
- Self-contained, re-circulating coolant system, with clean-out drawer to TRAP all grindings.
- Fully controlled cut assured by Hydraulic Operation of Horizontal Feed PLUS Precision Adjustment by Micrometer Stop.
- Handles single pieces or gangs at one presentation.
- Automatic flat surfacing or squaring leave operator's hands free to prepare next load of parts.
- Equally efficient in jobbing machine shops or on production.

For Production—Tool Room—Jobbing Machine Shop—Repair—Maintenance. Wet-belt Surfacing Will Do The Job Better At Lower Cost.

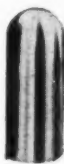
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MACHINE CO.**
300-1 Exchange Street
Syracuse 8, N. Y.

INCREASE MILLING PRODUCTION without Added Men or Machines!



MODEL 10-E
Not Applied for



Before



After

Aluminum Parts

These aluminum parts were milled upon the Aerco Multi-Grip Chuck at the rate of 355 per hour (floor to floor) as compared with single milling operations of only 71 per hour.



Before



After

Chrome Steel Parts

These parts, high heat treated of Chrome-steel, were produced at the rate of 42 per hour (floor to floor) on the Aerco Multi-Grip Chuck. Individual milling time was 15 per hour.

These parts milled with the use of the Aerco Multi-Grip Chuck show its versatility.

with the AERCO HYDRAULIC MULTI-GRIP CHUCK

Two rows of collets hold ten parts and both rows are milled simultaneously and with but a single loading increasing production as much as 500%.

Self-centering aligning collets insure perfect on-center milling regardless of slight shank diameter variations. Safety stop prevents damage to collets should all stations not be loaded.

Aerco Multi-Grip chucks may be used for both vertical and horizontal milling. Work is held rigidly in collets and cannot turn or be pulled out during milling operation, however clamping pressure is instantly releasable and self-opening collets can be quickly re-loaded.

Collet sizes range from $\frac{1}{8}$ " to $1\frac{1}{4}$ " and are available in round, square or hexagon shapes.

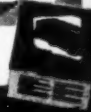
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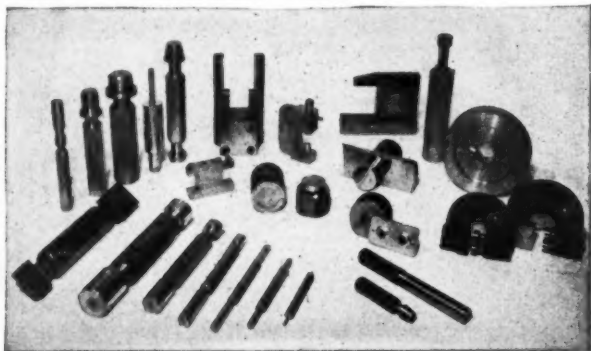
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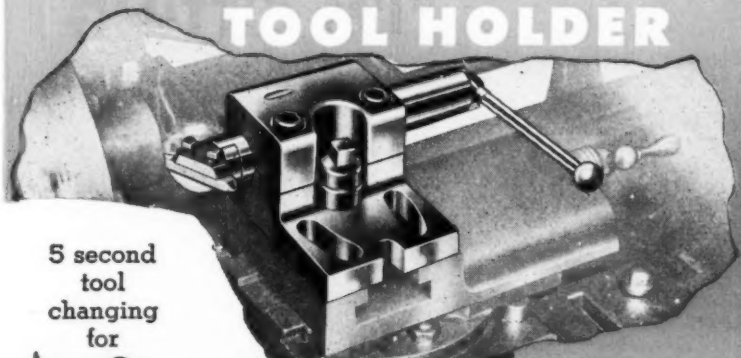
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5 second
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changing
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TURNING
6 other heads

Converts YOUR ENGINE LATHES INTO Production Machines

Here is a practical means of tooling up existing equipment for post-war production. You get quick, accurate tool changes so that any number of operations can be completed before stock is removed from the lathe. Standard high speed tool bits, mounted in detachable heads are quickly locked in place by a quarter-turn of the control handle. The wide base of the tool holder block is machined to fit the carriage compound and provides maximum rigidity that assures accurate repeating cuts. Made in four sizes to fit any standard make of engine lathe from 9" to 36" swing.

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Engineers and Manufacturers

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then he said to himself

"I'M SITTING TIGHT"



REPLYING to America's early proposals and assurances that the United Nations had no designs on Spanish territory, Dictator Francisco Franco defended his neutrality with:

"I will avoid anything which might disturb our relations in any of their aspects."

Sitting tight in any business is one of the easiest things a man can do.

The only trouble is that in this era of quick advances, sitting tight doesn't get one anywhere—but down—and fast.

And when the dust of the passing parade clears—it's a long, plodding process to catch up.

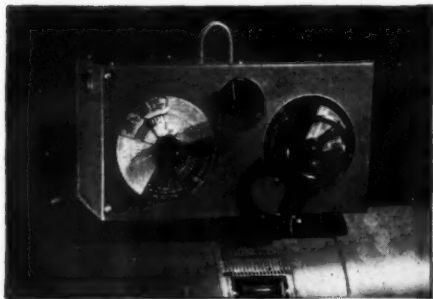
We see it well expressed in many "Stand pat" companies now making *no* plans for improving their welding methods—either in new production techniques or the latest welding equipment.

And others . . .

"SITTING TIGHT," *he says*

Look, Francisco . . . here is the wherewithal to step out in front with Arc Welding:

THE TOOLS FOR NON-STANDPATTERS



"SHIELD-ARC" WELDER

The "Job Selector" of the Lincoln "Shield-Arc" Welder permits selection of the TYPE of welding arc . . . a predetermined welding characteristic . . . to match the job. Its Current Control provides any desired amperage over a wide range. Both selectors are Self-Indicating for KNOWN results . . . unmatched speed, ease and economy of welding. The "Shield-Arc" is recognized the world over for its superiority 32 ways . . . described fully in Bul. 412.

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These world favorites have been copied extensively as to general appearance and color of coating. To enable you to KNOW that you get the genuine "Fleetweld," they now are marked with 3 GREEN DOTS. Look for this sign of Lincoln Electrodes . . . recognized the world over for their superiority in quality and economy. Complete details and welding procedures in the "Weldirectory," Bul. 402.



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America's greatest natural recourse

ARC WELDING

FROM BUFFING A FINISH to

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HEAVY WORK**

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There's a Stow unit to meet any requirement. For 70 years, since Stow created flexible shafting, that mechanical principle has assumed increasing importance in industry. As applied to operations like grinding, buffing, drilling, wire brushing, Stow shafting enables the workman to take the power to the job. Saves handling of heavy parts, gives wide working range to a single machine because of mobility, allows approach to the work at an angle, lets the operator reach easily into hard to get at positions.

The shaft is all-important on these jobs. Whether it's high or low torque, tough or delicate work, there's a Stow shaft suiting the purpose — driven by a motor that's approved by Stow experience — the longest in the flexible shaft industry. Almost every department needs Stow Flexible Shaft Machines. A catalog of all types is available free. Ask for it now.

STOW

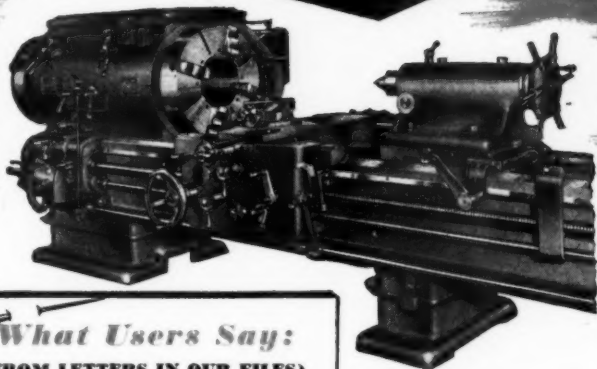
MANUFACTURING CO.

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Inventors and Developers of Flexible Shafting

Do It BETTER!... on a HYDRATROL LATHE

Large Hollow Spindle Type



30" Heavy
Duty Lathe
with 13"
Hole in
Spindle

What Users Say:

(FROM LETTERS IN OUR FILES)

"For quite a few years we have had a large number of HYDRATROL LATHES (Large Hollow Spindle Type) in our shops here. The men working on these machines appreciate the ease of speed control afforded."

"HYDRATROL LATHES have been entirely satisfactory for turning high-strength forged tubes in record time."

LOOK around your own shop—you may find a number of machining jobs which could possibly be done better on a Large Hollow Spindle Type of HYDRATROL LATHE. Send us prints of these unusual, difficult, or too-costly machining jobs, for a time-and-money-saving recommendation.

Five Sizes—18" to 36"

Small 18" up to 7 1/4" Hole
Medium 24" up to 12" Hole
Large 27" up to 13" Hole
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Large 36" up to 16 1/2" Hole

(Standard type lathes, 16" to 36")

*L*ehmann MACHINE CO.

CHOUTEAU AT GRAND * SAINT LOUIS 3, MISSOURI

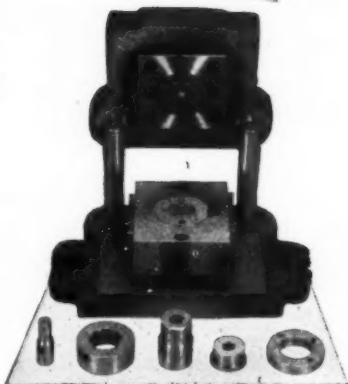


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You'll Never
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Once you use **HOVIS UNIVERSAL MASTER WASHER DIES** you'll never go back to the old, slow and expensive method of making a new die for each size and type of washer. Instead, you make a nominal investment in Master Washer Dies and then simply use 5 small, easily removable, interchangeable parts to make any size washer.

**WHEN YOU BUY FOR WAR PRODUCTION
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The Master Dies themselves do not become obsolete. Many of them have been in use for nearly five years. So all you need to consider are the 5 interchangeable parts for each size washer whether for wartime or civilian production. Write today for illustrated literature.



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IT TAKES **MORE** THAN JUST A MULTIPLE HEAD TO GIVE YOU REALLY FAST DRILLING



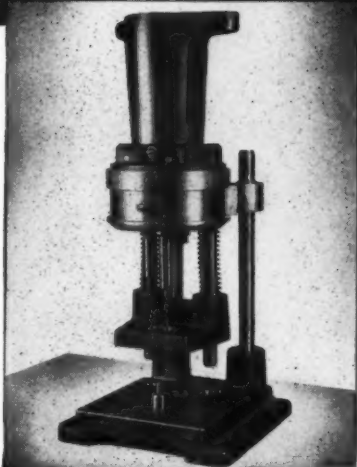
Screw with 2 spanner wrench holes — typical of hundreds of jobs of the same character. Part is simply laid in a nest — location and clamping is automatic — drilling at 5000 r.p.m. Drilling time — zippo!



This part with four holes is handled in the same way as the part above with the pressure pad-bushing plate method. No jigs, no hand clamping — just place the part and drill. Automatic ejection if desired.



Here's a die casting with 8 multiple reamed holes. Nothing to it with the pressure pad method — just lay 'em in the nest and ream. This method is so simple and fast, it pays even for parts with only one hole.



A multiple head is only one factor in fast multiple drilling of small parts. With it, you must have a set-up for fast placing and holding of the parts.

The Ettco-Emrick System of MULTIPLE SPINDLE HEADS

provides both the head and the handling tool-up. When you order a multiple head for a particular part, you get a completely engineered job—engineered to drill the most holes at one time and to give you the fastest handling of the work. Sometimes this means two or three times faster than you can get with a multiple head alone.

The system includes a dozen different standardized handling methods, one of which is the pressure pad-bushing plate, shown above in its simplest form, which clamps the work and guides the drills. It eliminates hand clamping, jigs, etc. You just place the part on the base and drill. The parts illustrated were done with this method.

Note that the Head and all parts are tied together. Simply clamp it onto your drill press and you're set to go. For top production at bottom cost, let Ettco-Emrick engineer your small parts drilling jobs.

ETT CO TOOL CO.
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*Over 25 years specialization in solving
Industry's drilling and tapping problems*



AS the nation begins to approach "normalcy" in production economy begins to resume its place as a factor for prime consideration. Every piece of equipment must prove itself worthy of being retained in the program of re-evaluation. Conway Clutches have proved their claim to remarkable economy and efficiency.

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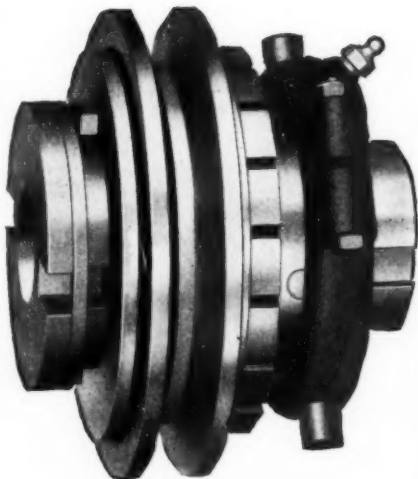
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CONWAY CLUTCHES

BUILT scientifically and precisely to furnish highest efficiency in minimum space. For restricted swing radii; for fractional horsepower motor shaft or oil engines.

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**1541 Queen City Ave.
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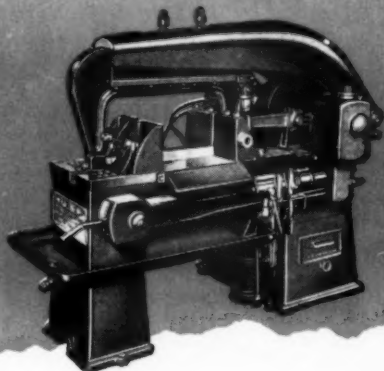
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Progressive Feed

the only correct metal-cutting principle

comparison proves

1. Proper Design — Based on nearly forty years experience in the art of metal cutting.
2. RACINE Machines meet accepted standards of the machine tool industry.
3. Easy to handle—Single lever control of all operating functions.
4. Hydraulic operation and control permits rugged construction—Economic production results.



PROPER application of the cutting tool is vitally important in sawing machines. That is why RACINE pioneered, many years ago, positive, progressive feed throughout the cutting stroke. This is still an exclusive RACINE feature.

Progressive Feed has these advantages. Undue strain is avoided. Each tooth is made to act like a parting tool. More metal is removed on each cutting stroke. That is the reason RACINE Machines cut faster and more accurately.

RACINE Hydraulic Machines incorporate a Dual (*positive and flexible*) Feed Control. Under positive feed the depth of cut is predetermined in every type of stock. Flexible feed enables the blade to cut faster in round stock and the lighter sections of tubing and shaped materials. Dual Feed is exclusively RACINE.

These scientifically accurate, fast cutting machines are available in four models and all capacities from 6" x 6" to 20" x 20". Write for catalog No. 12. At the same time outline the cutting work you have to do. Our engineers will recommend the best machine for the job.



RACINE

RACINE "Variable Volume" Oil Pumps A Modern Source of Hydraulic Force

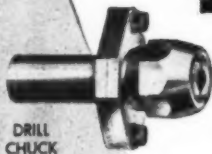
RACINE Oil Hydraulic Pumps in three capacities: 12, 20 and 30 G.P.M. provide from zero to full capacity without relief valves. They operate at pressures from 50 to 1000 lbs. P.S.I. Ask for catalog P-10-C.

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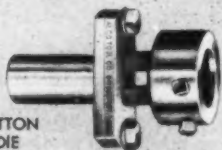
ACORN
DIE
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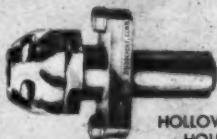
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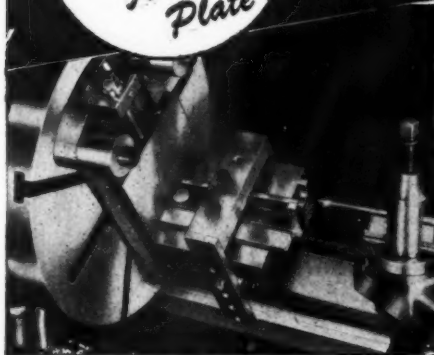
THE ALCO TOOL CO., 252 Birdseye St., Bridgeport, Conn.

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STOP making expensive jigs
for every special lathe job

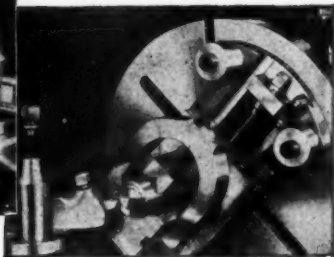
No. 51
*Lathe
Angle
Plate*

*Now Best Tools brings you the
New Time and Labor Saving*
NO. 51 LATHE ANGLE PLATE
For Off-Center and Compound
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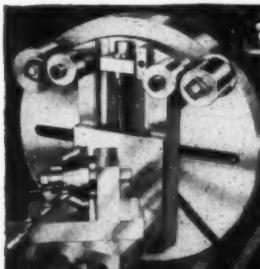


No. 51—Complete with straight adjustable clamp. Equipped with center gauge with provisions for counter-balances, Shown boring off-set radius.

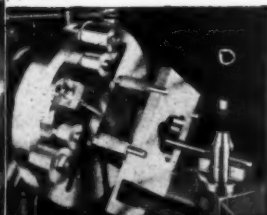
**enables your shop to turn
out out work samples or
short or long production
runs without building jigs
or fixtures.**



No. 51-B—Lathe angle plate is shown with accessory B, turning an eccentric.



No. 51-A—Multi-use accessory for Lathe Angle Plate, especially for offset angle boring and turning. Can be indexed to 12 divisions.



No. 51-C—Shown with work holder C, the Lathe Angle Plate is shown finish-boring a die plate.

MADE IN TWO SIZES

No. 51 for 12, 14, and 16 in. swing lathes
No. 52 for 9 and 10 in. swing lathes

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MASTUR PRECISION BORING HEAD

NO GIB, PERFECT ADJUSTMENT, DIRECT READING IN THOUSANDTHS, VERNIER READING IN TWO-TENTHS OF A THOUSANDTH. EVERY WORKING PART ADJUSTABLE FOR WEAR.



3 SIZES

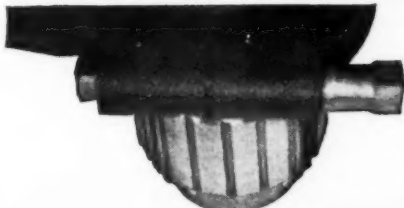
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YOU HARDEN IT—WE'LL DRILL IT

**DRILLING WORK
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**DRILLING SAW
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BROKEN TAP**

Write for
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"HARDSTEEL"
OPERATOR'S
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Also inquire about
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Many manufacturers are finding
it ideal for special parts that must
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DRILLS • TOOL BITS • SPECIALS

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BERKELEY

Drives Cut Production Costs

Speed has been a dominant need in the war effort. Production costs will determine whether or not you can meet the keen post-war competition.

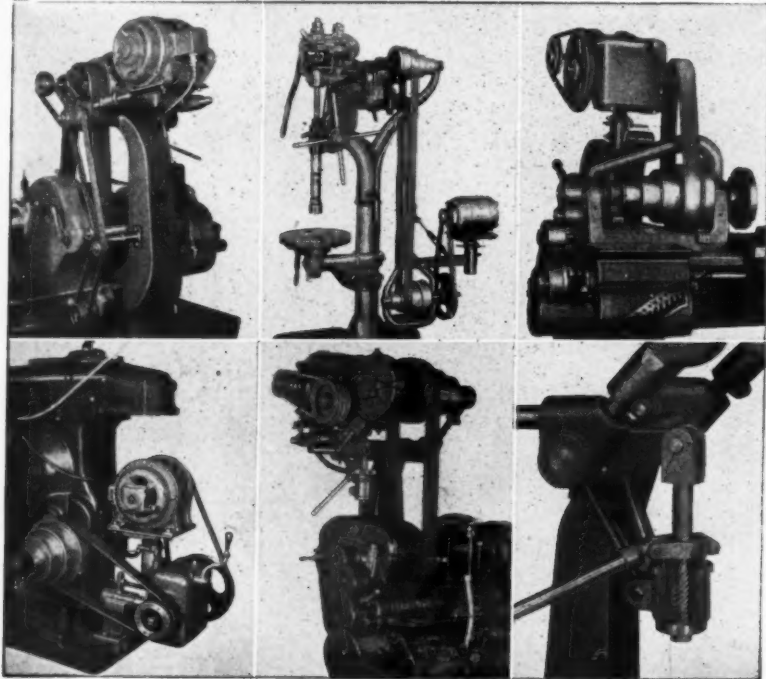
BERKELEY drives speed production and cut costs by providing just the right

speeds for up-to-the-minute tooling. This makes it possible for your machine tools to turn out the full production of which they are capable.

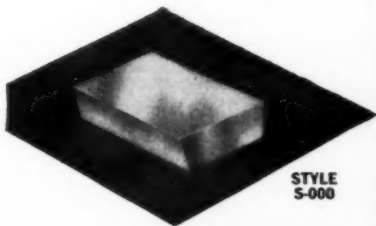
There's a BERKELEY drive for practically every size, type and kind of machine tool. They're designed specifically to fit your tools and engineered to enable these tools to surpass their best previous performance.

There is no obligation in putting your drive problems up to BERKELEY.

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New
KENNAMETAL
"Universal"
BLANKS



STYLE
S-000

**FACILITATE
 TOOL MAKING**

and Keep Stocks Down!

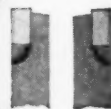
These new Kennametal "Universal" tool blanks are literally "jacks-of-all-trades." Rectangular in shape, with 12° clearance angle formed on one long edge, they can be used to make many different types of tools, simply by setting them into open-end recesses, as illustrated. They are available in all recognized standard sizes, many of which are stocked in several grades.

Their use reduces inventory investment, and simplifies stock room problems. And, above all, they make it easier for you to employ on a widespread, yet economical scale, the advantages of Kennametal—its ability to cut metal, including steel up to 550 Brinell hardness, accurately, at greatly increased speed, with amazing tool life.

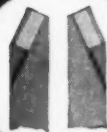
Catalog particulars, and prices,
 are yours for the asking.



STRAIGHT
TURNING TOOLS



TURNING TOOLS



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TURNING TOOLS



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TOOLS



THE *Carbide* AGE

AND WESSON SCORES AGAIN—PRODUCING A NEW CARBIDE CUTTING TOOL THAT TRIPLES PRODUCTION

One of our leading aircraft engine builders needed form-relieved milling cutters to speed up operations on aluminum rocker box faces on the engine heads. It was a tool problem of the toughest kind—practically every tool producer in the country refused to touch it.

WESSON engineers were called in and they scored again—the form-relief carbide milling cutters they developed now do the job far better and faster than expected. Feed of the machine was tripled—production tripled—time out for grinds tremendously reduced—parts between grinds stepped up from 800 to 6000 over the best performance of high speed cutters previously used.

The same **WESSON** carbide form-relieved cutting tools—redesigned a bit—were later put in action on a Greenlee Transfer Machine with exceptional finish and still greater production per man hour.

Yes, **WESSON** engineers can do it—and are doing it—again, and again—when you need tools that will put you in the clear on the score of better-faster-peak production—greater precision and better finish.

Keep this in mind—while you plan for the new postwar competition. You are going to have to retool—either right away—or a little later. To insure priorities on delivery—to benefit from **WESSON** experience and leadership in the design and production of Carbide Cutting Tools, write, phone, or wire

WESSON COMPANY, DETROIT 20, MICH. (Ferndale Station)





Get IT!

THE **Clark**

ADJUSTABLE TOOL HOLDER

with all these features

1. Exclusive vise-grip jaw exerts 4-sided pressure evenly over full length of cutter channel, prevents sagging under-channels and broken bits.
2. Bearing surface of the adjustable vise-grip jaw has twice the width and five times the length of the average tool holder, and takes 4 or more sizes of tool bits.
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5. Vise-grip securely holds and supports carbide bits, threading tools and boring bars. Protruding underlip prevents breakage.
6. Tilted position of head gives operator unobstructed view of cutting edge.



Adjustable
Vise Grip jaw
gives full bearing
for tool bits and
even distribution
of pressure.

SPECIFICATIONS

MODEL	SIZE	CAPACITY
60	0	1/8 to 3/16
61	1	3/16 to 3/8
62	2	3/4 to 1/2
64	4	3/16 to 5/8

With 15° or parallel cutter channel either left or right hand.

For complete information, call your Clark Cutter Jobber today, or write for catalog MTBB-1-TTL.

Tool Holder P62R gripping
Clark Lever-Lock Boring Bar

Adjustable
Hole Cutter

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CLARK CUTTERS

Robert H. Clark Company

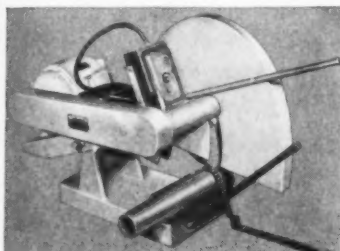
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"Senior" Model "Junior" Model

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Senior model specifications: Maximum sizes cut with 18" wheel 6" dia. tubing or pipe, 3 x 6" bar stock and 3½" rounds. Overall dimensions, height 24", width 19", length 40". Weight 340 lbs. Spindle dia. 1". 220 volt, 50 or 60 cycle, 3 phase 5 h.p. motor 2 v-belts, 3600 rpm.

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BLUE BOOK

Presents . .

All of us have been thrilled by recent exploits of the Super Fortresses. These graceful giants of the air fly higher, farther and faster and carry heavier loads of bombs and pack greater firepower. Producing B-29's in an ever-increasing volume has demanded clever tooling and real production planning. Al Jacobson tells some of the things that have been done by Boeing in the story commencing on page135

Modern army transport depends on truck fleets and sometimes the going is heavy thru mud and rubble. That's why the army specifies four-wheel drives. P. D. Aird tells how Chevrolet helped to provide the trucks by working out a method of producing Weiss joints. See page...159

Development of the new steel cutting carbides has revolutionized previous conceptions of metal cutting. How this will affect future machining operations is considered in the current chapter on metal cutting which begins on page.....187

Inventory time is here again and Arthur Roberts offers some constructive suggestions in the story beginning on page...213

The technical aspects of Foremanship are covered by Ed Mottershead in the story commencing on page.....225

"Let's Talk Shop" presents a number of new kinks and ideas in the section starting on page.....239

The monthly parade of new machines will be found in the What's New Section. See page270

Mechanics Thru the Ages, page.....410

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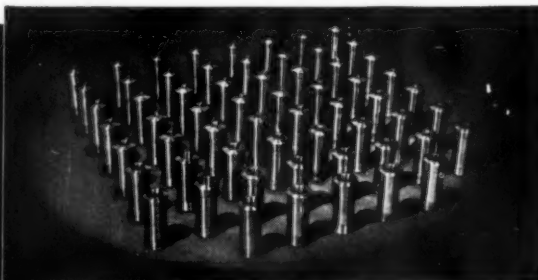
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AS THE *Editor* SEES IT



THE new German offensive must be a shock to complacent ones who figured last summer that the European war was about over. Had it been physically possible to supply the Third Army with the necessary fuel, Patton might have blazed a path straight thru to Berlin.

Frederick C. Crawford, Cleveland industrialist, who recently returned from an inspection trip of the European front, revealed that the Germans had been knocked off their feet and the impossibility of supplying fuel over the vast distances gave the enemy time to reform.

According to Mr. Crawford, one war is now ended in Europe and another new one has begun . . . a terrible new slugging war against a revitalized enemy and every American on the home front must re-enlist to help win it.

Since this new defensive war started a few months ago, German command by Hitler intuition is ended. Generalship of a high order is now apparent in handling the German forces.

Answering the question of why so many big shells are now needed, Mr. Crawford emphasized that

today artillery is carrying the load. Had the Army run into sunny weather, the demand would have been for more and more bombs.

When planes cannot fly regularly, artillery must take over. It resolves into a matter of expending shells or American lives. The American way is to win the war with expendable material instead of lives.

That puts it squarely up to us on the home front to supply the material. Too many people, placing selves before country have shirked their parts in the war effort. Physically, many of these are capable of performing a better day's work than others who are always on the job and continually working hard for final V-day. Too many thousands quit war jobs for peacetime employment. While one of the strongest natural laws is self preservation, right now, preservation of the country as a whole is more important than any individual.

Until after the final shots have been fired, we have a single duty . . . and that is to get whole heartedly and completely behind the war effort.

If we can't fight, we can work . . . buy more bonds and hold them!

Wesley G. Paulson



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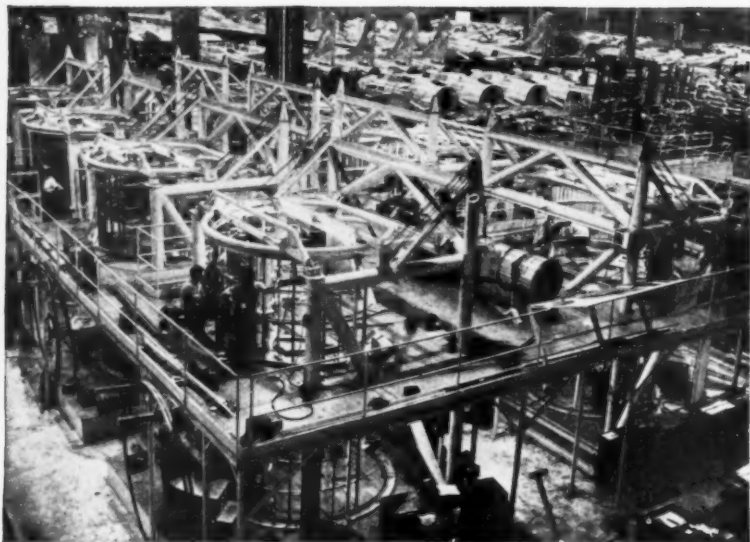
By AL JACOBSON

WHEN Boeing was awarded the joint Army-Navy E, the first of such awards in the aircraft industry, for its remarkable production record in producing the famous Flying Fortress, the B-17, the Tooling Division came in for a substantial share of the credit for winning this signal honor.

During the time Flying Fortresses were becoming the most feared aircraft in the vicinity of Berlin, more than 100,000 special tools of all kinds and classifications were built to meet the heavy schedule set by the Army. These figures do not include the many standard types of tools purchased from outside firms. Including these the total would be almost double. There is little question but that the large number of tools built by Boeing contributed mightily to the production figures established in B-17 manufacturing. These set a new high in aircraft output, a high that will in the not too far distant future be dwarfed by the present B-29 Superfortress program, an undertaking which calls for more factory space than any other single plane ever built.

These giant four-motored bombers are rolling from the assembly lines at the Boeing plants in Washington; and Kansas; from the Martin plant in Nebraska and the Bell factory in Georgia. In addition to these, the huge Seattle organization, plus its eight branch plants in the state of Washington, are rapidly being converted to B-29 production.

Tooling-up for the production of the Flying Fortress was a masterpiece of industrial achievement but compared to that of the Superfortress, a small task indeed. All major jigs and fixtures were designed in Seattle and produced in Wichita, whereas fabrication tooling was predominately of the latter's design and manufacture. Since the B-29 is being constructed at four widely separated points in the country, each builder is being furnished innumerable parts by sub-contractors in most of the 48 states. For instance, a sub-assembly from Detroit has to be built in such a way that it will fit a plane under construction in any of the final assembly plants. The production of all of these had to be perfectly coordinated and as Boeing was the original designer of the Super-



Foreground, fore and aft sections of the B-29 Superfortress' bomb bays in their major assembly jigs. Background, B-17 Flying Fortress tail sections and other major assemblies during the conversion to B-29 production.

fortress, as well as the Flying Fortress, it is only natural that this organization was made responsible for supplying the manufacturing, engineering and master tooling procedure.

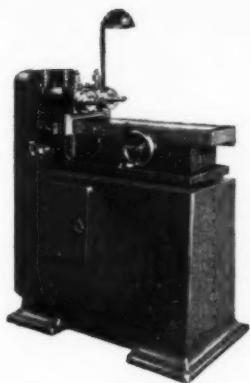
Master gauges are furnished to each manufacturing unit and sub-contractor so that all planes will be built exactly alike and call for identical parts and sub-assemblies. First Boeing was required to make Control master gages from which the masters could be made. Tolerances to the thousandths of an inch were absolutely necessary. The complexity of the job perhaps can be realized best when it is disclosed that the first experimental model of the B-29 had not been completed when the Army gave Boeing the green light for mass production.

This marked the signal for immediate purchase of large quantities of necessary materials and set wheels in motion which started the tooling-up program. First, however, the tooling requirements had to

be determined and the manufacturing procedure conceived. Since experimental plane models had not been completed, engineering was far from ready and not finished until a year after the tooling program was inaugurated. Because of this, many phases of tooling had to be anticipated in advance.

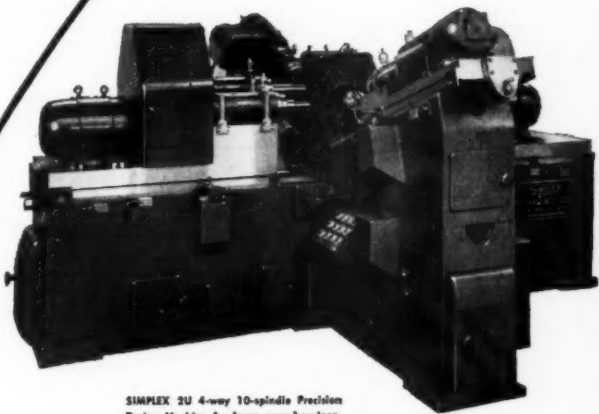
Boeing has long utilized manufacturing methods which featured simplification of individual jobs and pre-completion of major parts before final assembly. Thus, one of the initial steps very necessary was to break down the giant bomber into component parts and design and build jigs, not only for the major and minor assemblies but also for pre-fabrication. The importance of utilizing jigs to the utmost was realized by Boeing far ahead of most manufacturers. This realization was born before the war, when many builders of aircraft were still making each individual part more or less by hand, or at least in small numbers. Even in the early days of the war, when many

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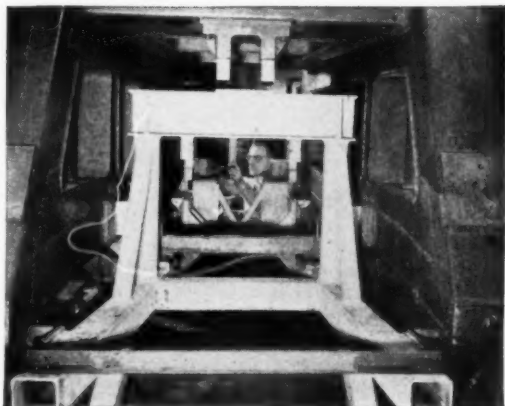


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An assembly jig for the B-29 is checked for accuracy on a Master gauge. The worker in the background is making certain that the drill hole of the jig matches with the coordinating hole in the master gauge (dark colored). This jig will be used in making the inboard nacelles and will make certain that the points of interchangeability on all parts are accurate.



male workers were available, Boeing engineers stressed building by jigs. They were able to foresee the time ahead when most men would be needed in the armed services and the fight on the home front

would fall for the most part upon the shoulders of women, who were far more at home in the kitchen than in a factory. Thus it was necessary to make the building of planes as simple as possible—so



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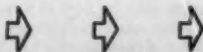
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simple in fact that newly trained workers could keep up with one of the heaviest mass production schedules ever set.

This simplification program is being carried even to further lengths in the present Superfortress schedule because it was realized that critical labor shortages were imminent. This has proved to be all too true and today more and more help is needed to keep more and more B-29's winging in the direction of Tokio.

While jig construction reached a new high in building Flying Fortress tools, the largest of which were the three-story high wing jigs, today Superfortress tooling reflects the best ideas yet devised for aircraft production. Stressing simplicity of design, it provides ample rigidity for holding major assemblies to the accurate tolerances demanded. At the same time it affords a maximum of elbow room for workers. Modern lighting was utilized to the utmost to reduce eyestrain and errors to a minimum. Adjustments on the jigs enable inspectors to check accuracy to the limits of 5/10,000ths of an inch.

The smallest of Boeing tools are the aluminum grommets used to hold together the longitudinal and circumferential stiffeners (the metal ribs that encircle the fuselages) while riveting is started. One of the largest tools being used, one which has made an important contribution to mass production, is Boeing's "Octopus" a circumferential hydro-punch that performs 19 different punching operations at one time, making "V" type slots in the circumferential stiffeners. This machine turns out 45 times as many parts as the one previously used. An outstanding development of Boeing engineers is the method of accurately corrugating Dural, frequently used in plane construction, and now being used thru-out the aircraft and aluminum industry.

Many hundreds of changes and improvements in the design of Boeing bombers have taken place and will continue to take place. Because of this, it is essential that the tooling department be so organized that it can turn out a new die within two weeks after receiving the change notice. Comparing this with the two to six months required by the auto-

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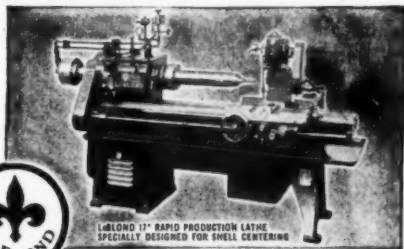
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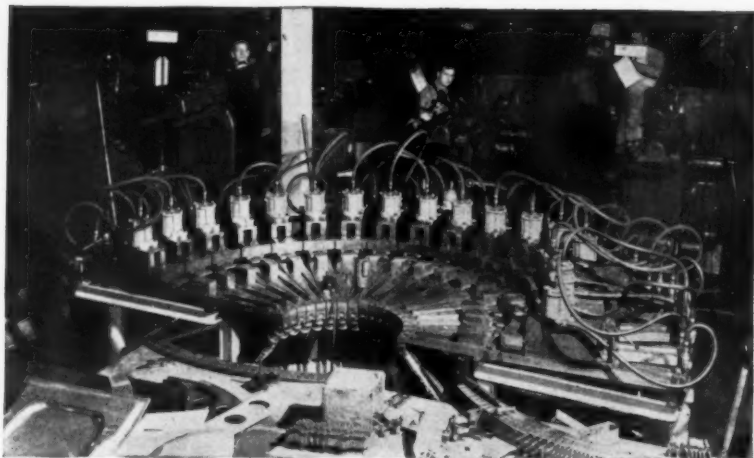
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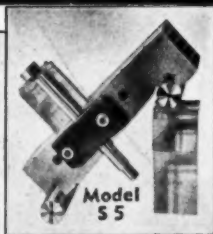
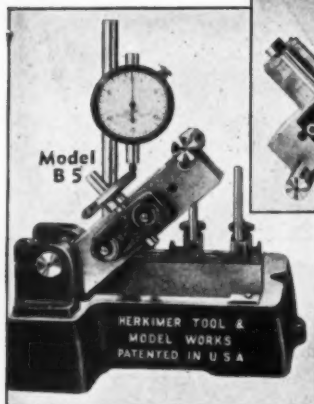
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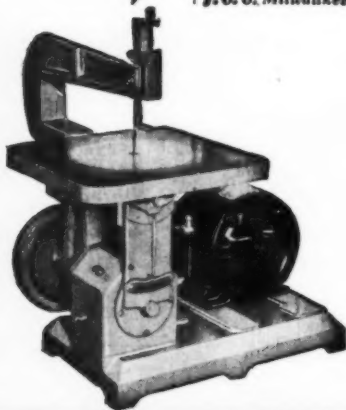
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motive industry, it can be seen readily that the adopting of aircraft tooling in many branches of that industry is almost certain in the future.

Instead of using hard die steel, as does the motor industry, Boeing makes many of its dies from Kirksite, a special zinc base metal which they are able to melt and cast. First a plaster and wood "mock-up" of the die is made to shrink scale (Kirksite shrinks $\frac{1}{8}$ " to the foot). From this a plaster mold is made. The mold is lacquered and a plaster pattern is in turn made from the mold. The pattern goes into the foundry, where it is packed in casting sand, the pattern removed and the die cast. Later, when cool, the die needs a small amount of polishing to remove the rough marks of the sand. After being checked for accuracy, it is ready for use. This process is particularly adaptable when it is not necessary to make more than five to ten thousand parts from a single die.

An example of how this method works can be illustrated best by the tail gunner's door of the Flying Fortress. The door, as it was first built, required a jig and more than 30 parts which were assembled by riveting and spotwelding. Twenty-six parts, along with numerous rivets, were eliminated when a die for a draw and form operation was made. In addition, a considerable saving in time was effected by not having to assemble the doors.

Changes like that just mentioned are frequently made when a saving in time is possible. Whenever such changes are made, dies or other tools are first constructed. The tooling engineers and designers prepare the new item on blue prints and then the tooling fabricators proceed to make the tools.

Fabricating parts on draw and form dies from Dural or Alclad is entirely different from doing the same job with steel. In the automotive industry for instance, it is possible to change the thickness of the steel or to use a metal of a different analysis if the die does not function properly. Airplane construction, involving maximum strength with a minimum of weight, requires that a certain thick-

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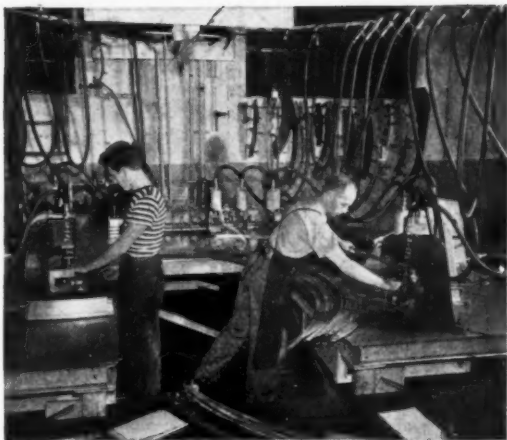
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ness or gauge of metal be used. Dural is the answer for it does not flow in a draw and form die as do many kinds of

steel. One thing to remember is that heating with a torch, a method used in some press operations of steel, can't be follow-

No. 2 To No. 6

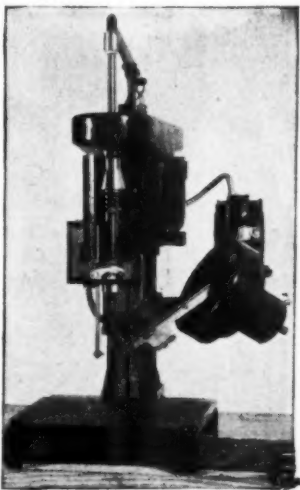
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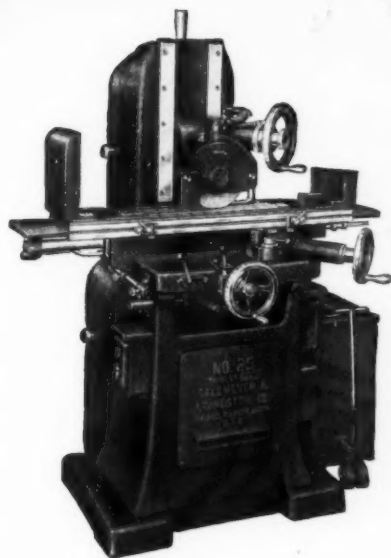
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Our No. 703—three layers of seven diamonds each. Multiplicity of cutting points: depending on diameter of wheel, four or more diamonds will always contact the wheel, giving finer dressing and precision finish. Recommended in all straight-faced dressing and truing on wide-faced, hard silicon carbide wheels. Used most effectively on Cincinnati Centerless, Norton Cylindrical, Landis Cylindrical, and Cincinnati Cylindrical Grinders.

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Branches: London; Bahia, Brazil

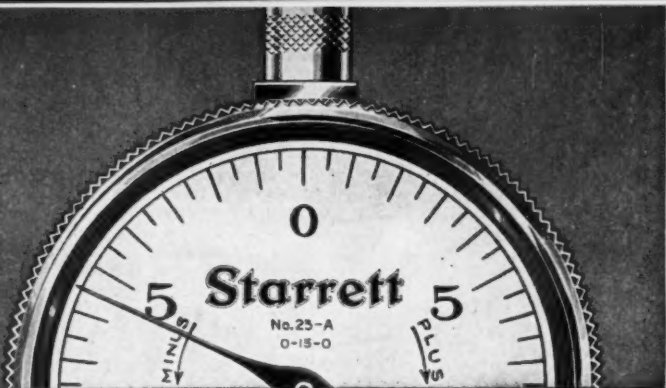
ed on Dural because the aluminum compound will lose its strength.

There are a lot of kinks to be ironed out in order to utilize draw and form dies and Boeing has done its share. One of the outstanding accomplishments was the ability to retard the action of heat treating Dural. In order to provide additional strength, it had to be heat treated, a process which causes the metal to warp, making the pattern out of true. Boeing's method requires putting the heat treated metal on dry ice afterwards. The period of setting up, consequently is retarded as long as the metal is kept at a sub zero temperature. Removed from the dry ice, the treated parts are put on a restrike die which restores them to their original shape, and shortly afterwards the heat treat sets up to maximum strength.

Probably one of the greatest advances in reducing the number of man-hours of hand-tool operations that go into airplane assembly is the development of full-sized hole coordination in the intricate framework of stiffeners of the fuselage. Formerly airframes were made by tying the parts together by drilling and riveting with portable tools.

Full-sized hole coordination means the prepunch of parts, such as circumferentials and clips so that the mating holes will match without reaming or cleanup. This process is entirely different from the use of undersized pilot holes in one or both sections of the mating members which must be drilled or reamed to full size when the parts are located in the jigs. Where tolerances up to 1/32nd of an inch are permissible, such as on bolted connections, the coordination is not such a difficult problem. The real difficulty lies in riveted joints where only a few thousandths of an inch tolerance are allowable if proper rivet "fill" is to be obtained.

In dealing with light materials, such as make up the air-frame proper, there are apt to be variations of temperature and creep during fabrication. Manufacturing tolerances in rolling, extruding, forming and machining these materials may be accumulative in their effect, adding to the



On The FACE Of It . . .



This Starrett "LAST WORD" Indicator is checking the concentricity and alignment of the aft end of an aircraft torpedo's balance chamber at The Buillard Company's plant.



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ANGLES

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problem of accurate coordination when the parts are fitted together. The tooling for hole coordination is made even more difficult due to the fact that airplanes have relatively few parallel lines.

The driving of a $\frac{1}{8}$ " rivet is a good example of the problem of close hole coordination. To insure proper rivet "fill", Boeing specifications call for a 0.131" hole. This is much more exacting than that of most commercial manufacturers who are more liberal. Rivet shanks tend to become larger as the rivet die wears thru constant use and for this reason, extreme accuracy is necessary and demanded at Boeing when hole punching is performed. It has been noticed, in large runs, that rivets with a diameter of 0.128" are common.

Boeing has discovered that good pressed metal practice permits a tolerance of plus or minus 0.005" between the centers of punched holes in sheet metal parts. Two mating parts, then, may have holes as much as 0.010" off center, whereas the clearance between rivet and hole is only 0.003". These figures do not include other possible causes of variation. The fact that variations in this amount, can and often do exist, explains the still wide use of portable tools in drilling and riveting at assembly. In order to obtain full-sized hole coordination otherwise, hole center limits must be kept within limits more on the order of plus or minus 0.001 than plus or minus 0.005". This, of course, is applying the precision of fine machine work to sheet metal work, a practice prevailing in some instances in the manufacture of Boeing bombers.

This is noticeable in the precision work in connection with punching circumferentials for the rivet holes used in attaching clips. These are small, angle-shaped stampings which can be pierced in a punch press without difficulty. The big problem is to locate and punch accurately, the mating holes in the circumferentials, a problem which caused Boeing to develop a hydro-pierce machine.

This machine is similar to the "Octopus" mentioned earlier and is called "Octopus Jr.". Both have various hose lines which connect an overhead hydraulic system

Henley

NEWS...

-1874-

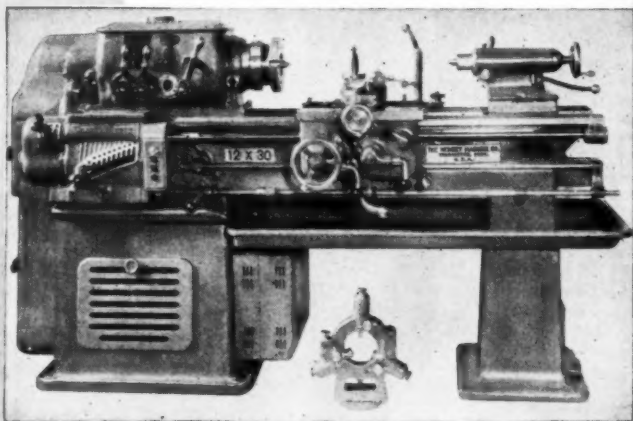
**71 years of
continuous
manufacturing
of machinery
and machine
tools**

-1945-

The Henley Lathe became in the year 1892 (52 years ago), the original "QUICK CHANGE GEAR ENGINE LATHE." This condition was brought about by the application of the Norton patent Quick Change Gear Box, eliminating the necessity of making a gear change for each different thread to be cut. Naturally this gear box immediately revolutionized thread cutting.

The 12 changes in the original gear box were afterwards increased to 36 by the application of an outer 3-speed box, giving a normal range of 1½ to 80 threads per inch without gear change. The flexibility of the Norton System permits the ready cutting of many unusual pitches not found on the index plate. This feature has long been highly valued by the skilled tool, gage and instrument maker.

The high precision required in special threads where used for gage work, etc., is well taken care of with a Henley Lathe fitted with a precision leadscrew, in the making of which the Company has long been established.



A HENLEY 12-inch 18-speed Precision
Geared Head Tool Room Lathe.
Other sizes 9", 14", 16", 18", 20", 24" swing.
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TORRINGTON, CONN.**

to the individual punch machines and resemble the tentacles of a sea monster. Photographic templates of the work pieces are laid on the flat, semi-circular work table boasted by "Octopus Jr.". The templates show the positions of all rivet holes and locate the rivet hole piercing units by means of dowel pins.

Each of the piercing units consists of two standard parts—a frame with a hydraulically operated ram and a die set in which punches and dies are mounted accurately before being pierced. The die

set is attached to the frame by a wedge block and a dowel pin which position it fore and aft and transversely. The die set may be removed in a minute or less since the connection is very simple. The setting of punches and dies in the tool room is possible because of the removable unit, and greater precision can be expected than if the setups were made on the machine.

Hydraulic pressure for the rams in the frames is supplied thru flexible hose from an overhead air source. A foot valve operates the piercing units. A cylinder above the work table supplies the hydraulic pressure. This cylinder in turn receives its pressure from a larger one served by the plant's compressed air system. Twenty-four piercing units can be operated at one time, each from its own pressure hose, and on small piercing jobs, two operators can work at the table at one time.

The machine also has clamps which hold the circumferentials in position for piercing. They are air operated and held on the set-up template in the same manner as the die holder units. The operator places a circumferential segment in the machine, locating it on a previously pierced notch. Tripping of a lever actuates control valves, first of the clamps to hold the segment in place, and then of the piercing units. After leaving this machine, the segments are routed to a pneumatic riveter, where an operator inserts rivets into the pierced holes and then thru the matching holes in clips and brackets and rivets them together. Afterwards, in the same fashion, two segments are riveted together and so on, until a complete circumferential is made up. The next operation of the process is to insert the longitudinal stiffeners in the clearance holes in the circumferentials, drill and rivet them to the clips, and the result is a section of the airframe being completed.

Under normal conditions, the achievements of Boeing engineering and tooling divisions would have been considered outstanding, but having accomplished the advancements and set the production figures they have, at a time when tool and diemakers are at a premium, is indeed a tribute to American mechanical genius.



For Machine and Tool Work & Quick Set-Ups

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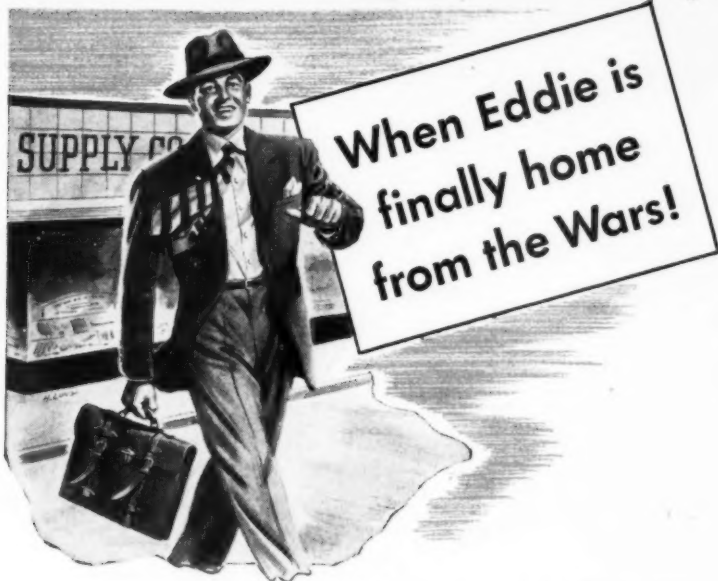
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A lot of people are going to be mighty happy when Eddie comes home. His family, of course . . . and his boss . . . and you.

Eddie used to work for your ***Industrial Supply Distributor**, and his former job is waiting for him. He's eager to get back into "civvies" and to start calling on you again, as he did in the good old days. You'll find him just as willing and helpful as ever.

Yes—it will be good to have all the

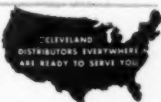
"Eddie's" on the job once more, showing you new products, helping you locate the hard-to-get items, pointing out new ways to cut costs and speed production. In the meantime your ***Industrial Supply Distributor** is worthy of all the cooperation you can give him. Short-handed and harassed, has he not been doing a pretty good job of taking care of your requirements during the present emergency?

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NEW!

NORTON
4" TYPE C
GRINDER

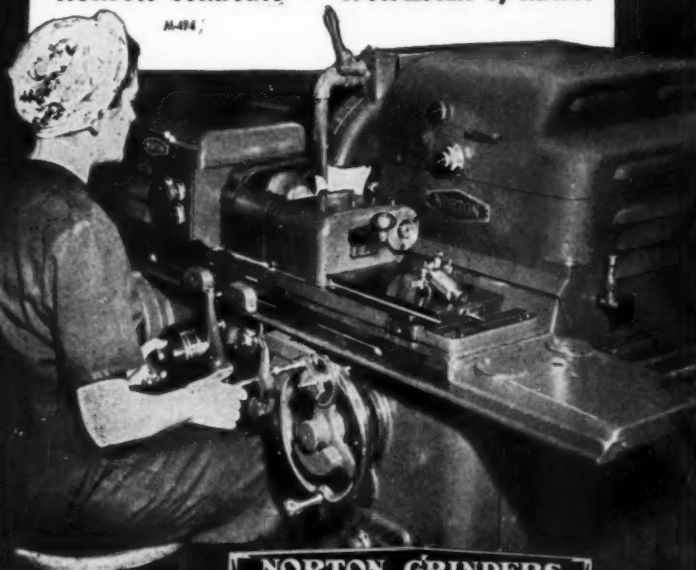


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Extreme accuracy, high production and convenience of setup and operation make this new Norton grinder ideally suited for grinding a vast assortment of small revolving parts that are used in instruments and the mechanisms of modern high speed machinery and appliances. Catalogs and information on this new Norton 4" Type C Grinder on request.

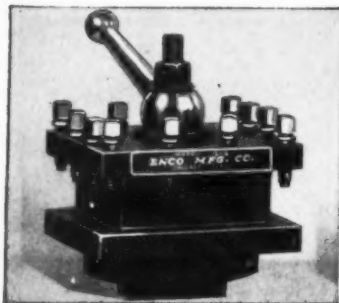
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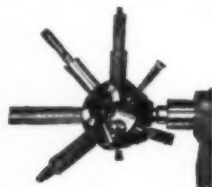


NORTON GRINDERS
and Lappers

ENCO TURRET TOOL POSTS



MODEL	Model 6-S 2" to 3 1/8" incl.	Model 3-H 1 1/4" to 1 7/8" incl.	Model 2 1/2-S 3/8" to 1 1/8" incl.
LATHE SWING	16" SWING & UP	10" TO 13" SWING	BENCH LATHES
TOOL SIZE RANGE	5/8" to 1 1/4" or No. 2 toolholder 3/8" square bit — High speed or carbide. (Where no tool bit size is specified, turret will be furnished for No. 2 Tool Holder.)	1/4" to 1/2" (Where no tool bit size is specified, turret will be furnished for 1/2" tool bit.)	1/4" to 3/8" (Where no tool bit size is specified, turret will be furnished for 3/8" tool bit.)
SPECIFICATIONS	4 tool 12 positions 6" square Mac-its Tool Post Screws Packed in crate Shipping weight 37 lbs. Price \$99.00	6 tool 12 positions 3" Hex Packed in carton Shipping weight 8 lbs. Price \$35.00	4 tool 12 positions 2 1/2" square Packed in carton Shipping weight 4 lbs. Price \$23.00



← Typical example of tools set up in Model A

Model A 2 1/2" in diameter with 6 bored 5/8" tool holes. Fitted with No. 1 Morse Taper arbor or fitted with No. 2 Morse Taper arbor (No. 2 Morse Taper arbor furnished unless otherwise specified). Packed in carton. Shipping weight 3 lbs. **\$18.95**

Model B 5" in diameter with 6 bored tool holes.....**\$32.95**

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Severance complete line of "Carbide" Midget Milling Cutters are now available.

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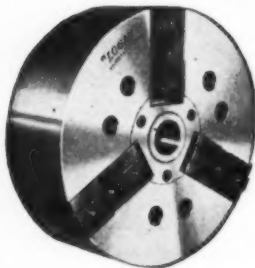
SEVERANCE TOOL INDUSTRIES INC., Saginaw, Michigan. Plants in Long Island City, N. Y.; Detroit, Mich.; Fort Wayne, Ind.; Chicago, Ill., and Los Angeles, Cal.



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Air-Operated Chucks**

on Foster Fastermatic Automatic Turret Lathes . . .



*Model 330 Logan 3-jaw
universal chuck
without false jaws.*

Standard Logan air-operated chucks provide fast, accurate, positive chucking of parts—in a matter of seconds—on this job performed on automatic turret lathes. Chuck jaws are quickly opened and closed by simply turning the lever of the air control valve. As a result, valuable operating and machine time is saved, production is increased, and hazards from improperly chucked workpieces are eliminated. One woman operator runs two lathes and handles the entire job.

In addition, turning accuracy and finish are greatly improved because the unusually compact Logan chuck minimizes overhang, thus promoting rigidity and strength of the set-up. The constant, regulated pressure of the chuck jaws prevents distortion of work.

Logan provides equipment for the complete chuck installation—rotating air cylinder, air control valve and accessories. Standard chucks also available in other types and sizes; special chucks supplied to meet unusual requirements. Hydraulic operated chucks, hydraulic control valves and hydraulic power units for jobs where hydraulic actuation is desirable.

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Write for new catalogs covering Logan chucks, air cylinders and accessories, hydraulic cylinders, and hydraulic power units.

CHUCKS • CYLINDERS • VALVES • PRESSES • SURE FLOW COOLANT PUMPS

Producing **WEISS JOINTS**

By P. D. AIRD

BEHIND the story of Allied successes in France, Italy and the Far East, where motorized equipment is daily playing a vital role, lies a fascinating story of America's production battle.

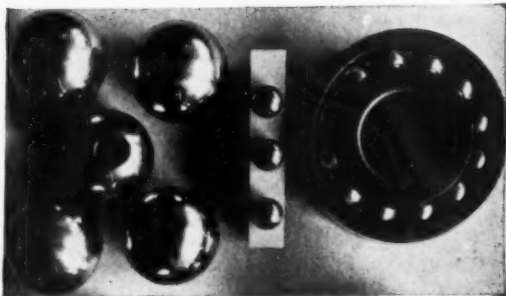
It is the story of how automotive engineers and designers, working for the

most part with existing equipment or with equipment which could be quickly obtained, transformed their plants from conventional production of civilian trucks and vehicles to military requirements, even tho in the case of armored vehicles, it involved meeting the Ordnance requirement of "all-wheel" drives.



This is a Gleason gear generator as converted in accordance with procedure established by Chevrolet Gear and Axle division engineers. The arbor holds a Weiss joint yoke. The top motor drives the cutter. The cutter is held in the cradle which rocks to cut a curved raceway in the yoke. Notice the massive stock divider and the arbor which maintain depth of the raceway planes.

The five balls at the left are the "heart" of the Weiss constant velocity joint. The center ball provides the steady flow of power from the motor to the driving gears. It is held in place longitudinally by a steel dowel pin. The balls come in seven standard sizes and bearing at the right gives some idea of their size. It is the thrust bearing of the hypoid pinion on a Chevrolet passenger car.



Military vehicles weigh more than civilian vehicles. They carry and pull heavier loads under conditions rarely encountered in civilian life. They must be able to travel over rougher roads and across country; up steeper grades, thru forest and stubborn brush, over fields and rubble, across ditches and streams and thru mud and sand.

Such operations demand that every wheel be able to exert tremendous effort

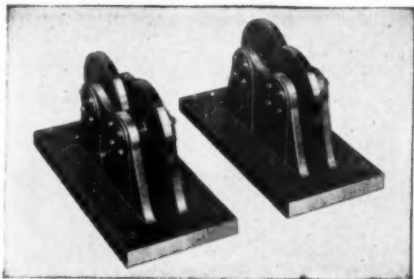
and, that means that the front wheels, as well as those in the rear, must be power driven.

When we began our all-out effort for war, prodigious quantities of 4x4, 6x6 and half-track vehicles were required within a very short time for the rapidly expanding military and lend-lease needs. The War Department assigned development and production of these vehicles to the nation's automobile manufacturers.

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Especially suited for large diameter work, as a sub-base can be made of proper height to give necessary clearance for work.

Anderson Pillow Block Balancing Ways are precision built with chilled iron discs which rotate with minimum friction on sensitive special bearings. Many manufacturers have endorsed them for profitable, efficient, static balancing.



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**FIVE OPERATIONS AT ONE
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CUTTING**

This milling machine will perform and accurately produce to full capacity at all speeds and feeds. Here are some of the ways that the **KNIGHT MILLER** can save you valuable hours on many jobs. Equipped with a special swivel and tilting table that saves the use of angle plates, cutters and special fixtures. The No. 40 has a wide range of capacity fitting it for many jobs and uses. There are 18 different spindle speeds and 16 different table feeds available.

WRITE FOR FOLDER



W.B. KNIGHT

MACHINERY CO.

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ST. LOUIS, MO.

These are the cutters and gages used in making Weiss joints at Chevrolet Gear & Axle in Detroit. Below is the paddle gage. The ring gage slips over the cutter and its face squares the paddle with the cradle axle. In outlining the method of manufacturing Weiss joint yokes on existing machines Chevrolet engineers were required to develop the gages and inspection necessary to hold production within the close tolerances demanded for efficient operation of the joint.



Since the front wheel drive feature had not been required in their regular products, but few of these manufacturers had intimate knowledge of the mechanism. It

was easy to conceive that an inverted rear axle could be used at the front of a vehicle to provide power to the wheels. It was also conceivable that a uni-

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Immediate delivery.



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Acme Anti-Wear Anvil Blocks are lapped flat and parallel on all four sides to within a few millionths of an inch. Are made of hardened and seasoned gage block steel for long service. Standard size Blocks are $\frac{1}{2}$ " wide, $\frac{1}{2}$ " high, $1\frac{3}{8}$ " long.

Bear in mind . . . these Blocks are in everyday service in our own shop and have proved of great value to us. Take advantage of our experience and equip with Anti-Wear Anvil Blocks now. Order today.

We also make instrument Anvils to order. Send us your requirements.

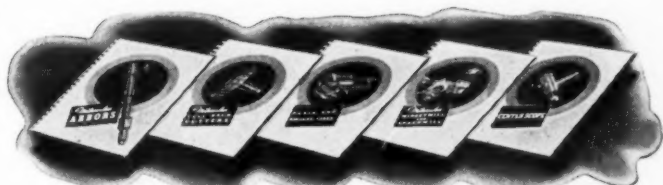
ACME SCIENTIFIC

DIVISION OF

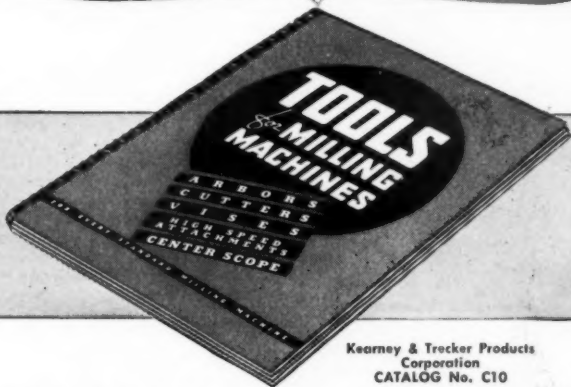
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wants to have around—handy! This bulletin would prove useful to your superintendent, master mechanic, tool and die men as well as your purchasing executives—send us your list on your company letterhead and we will be glad to mail copies to everyone interested in your organization. Would you tell us, please, the name of the magazine in which you saw this announcement.

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Cutting bar can be set to any position in Tee slot of slide. Hardened and ground throughout. Feed screw and worm ground from solid. Gears and feed nut phosphor bronze. Head 3" dia. x 4" long. Wt. 9 lb. Any type shank furnished. Write for complete information.

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**CHANDLER
- DUPLEX
BORING AND FACING TOOL HEAD**

versal joint could be incorporated in each of the axle shafts near the wheels to permit articulation needed for steering, but the kind of universal joint to use required investigation.

Only two basic types existed—the Cardan cross-pin or spider type and the constant velocity type. The former had been used exclusively to inter-connect the engines of automobiles and trucks to their rear axles thru propeller shafts but never had been adapted successfully into front axles as a means for steering.

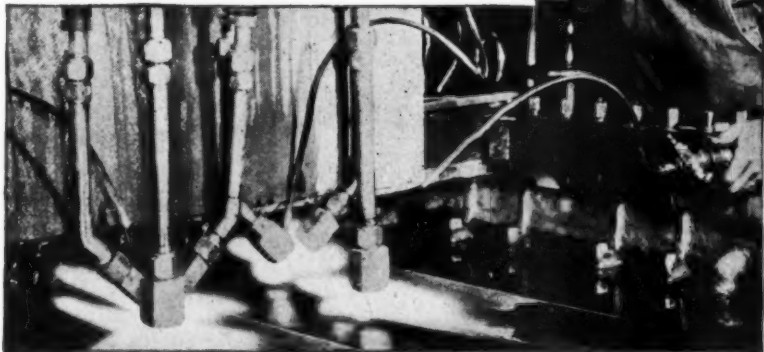
The constant velocity type, however, had been used to a small extent in that function and two American firms then were producing their individual designs of this joint in limited quantities, primarily for special industrial installations. For these reasons, the nation's larger automotive producers adopted the more simple of the two designs of the constant velocity joint. This was the Bendix-Weiss joint, made by Bendix Products Division of Bendix Aviation Corp.

There were several factors which influenced the decision. The Weiss joint is simple in design and quite adaptable in an axle shaft, since the joint itself becomes an integral part of the shaft and no interconnecting splines or sleeves are needed. The driving and driven parts are two forged sections of the axle shaft. The longer part is the driver; the shorter one is driven. The adjoining ends of these are identical and are upset to form yokes of a smooth geometric shape in which the raceways are machined. The races form a raceway of which one-half is in one yoke and the other is in the second yoke.

Four large driving balls are hand pressed into this raceway. As the axle shaft revolves, they roll around a fifth ball, which is the center of the joint's articulation. The center ball, in turn, revolves on a dowel which is retained longitudinally by a lateral pin riveted in one of the yokes.

The balls are selected sufficiently larger than the raceway so that when pressed in place, they preload the joint to a point where 220 to 230 pound-inches is needed

Bedway accuracy maintained by MONARCH FLAME-HARDENING



Even though subjected to grueling service during wartime, the flame-hardened bedways of Monarch Lathes will retain their accuracy for peacetime operations.

This Monarch process gives cast-iron bedways a hardness equal to that of hardened steel, yet preserves the valuable qualities of the microscopic particles of graphite, which provide a lubricative property to cast-iron sliding surfaces that is not

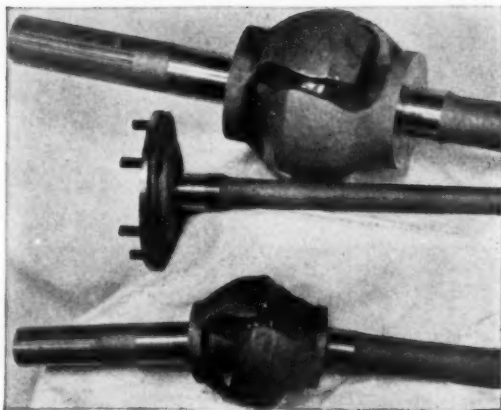
found in steel. Thus bedway accuracy is maintained even under the most severe use.

Flame-hardening is but one of many outstanding developments in lathe design which have been made by Monarch. The same progressive engineering which has built Monarch's reputation in the past can be depended upon to maintain Monarch leadership in the future.

THE MONARCH MACHINE TOOL CO. • SIDNEY, OHIO

Monarch Saves Time

Here are two Chevrolet articulating front axle shafts with Weiss joints. The lower shaft drives a large sized military truck. The upper drives the British Staghound or armored car. The services of two men are required to assemble this shaft and carry it. The center shaft suggests the sizes of the others. It is the rear axle shaft of a Chevrolet passenger car.



to break the assembly its full angular amount in any direction. Assembly is a matter of closely fitting parts in which the lateral pin is the lock.

In action, the Weiss joint drives thru

two diametrically opposed balls in one direction and the other two in the reverse direction. This transfer of torque from one side of the joint to the other thru only two balls in what is, geometrically,

Season's Greetings



We extend our best wishes for the coming year, with the hope of an early victory. Whether for war production or peacetime purposes, Master Gauge stands ready to serve your requirements.

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JIGS, FIXTURES**

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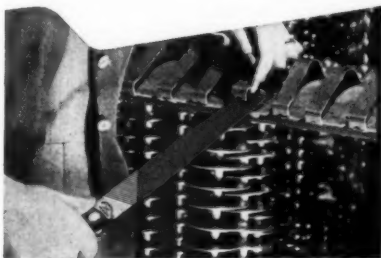
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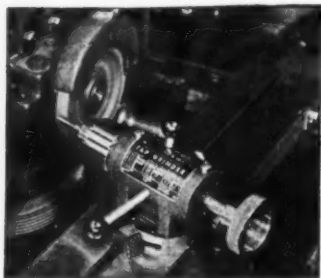
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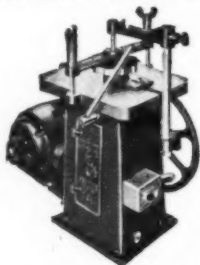
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the same race, precludes any need for super-fineness of manufacture, such as that associated with grinding an anti-friction ball bearing.

With the proper tools, the Weiss joint is easy to make. Every operation is conventional and simple, except for the machining of the races. These are cut in a circular path and all related dimensions must be held to close tolerances. For the one purpose of machining these races, Bendix had developed a special intricate milling machine.

At the start of the national defense program, they had adequate manufacturing facilities to meet the needs of their regular customers, but could not be expected to meet the additional sudden and enormous demand that the military needs created.

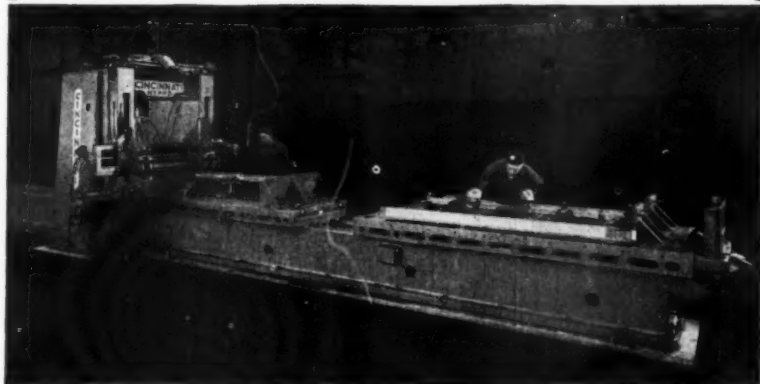
Moreover, their immediate expansion to approach these new requirements was not possible since the already over-burdened machine tool industry could not then supply the required additional special machines. Accordingly Bendix authorized the automobile makers to produce in their own factories, by any means they could devise, the Weiss joints Bendix could not supply.

One of the larger manufacturers so licensed, was the Chevrolet Gear and Axle Division of General Motors Corp. Not only were they responsible for manufacturing all the Weiss joints for the military vehicles they were to produce but, also, for approximately half of those of the General Motors Truck and Coach Division. Ultimately, their share of this production amounted to about 35 per cent, Bendix' about 50 per cent, and other manufacturers about 15 per cent.

The situation was desperate when the automobile industry was given the problem of solving a new way to machine the races in the Weiss joints. Time was the important factor.

The problem relayed to Chevrolet Gear and Axle engineers was entirely new to them. None was familiar with the joint's design or construction. Their prior business had been the manufacture of gears,

Beating the Old Two to One Ratio With a Cincinnati Hypro Planer



OFTEN one modern planer can do the work of two old machines. But by the use of the two-piece table arrangement offered by the Cincinnati Planer Co. production is increased by more than the usual 2 to 1 ratio for new over old planers.

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One table is used to machine a job while the other table is used to set up the job to be planed next. When the machining operation is completed the operator hooks up the table on which his next work is set up, moves it over the bull gear, disconnects the table with the finished work and begins planing on the new job.

Write for Planer Catalogue 136.

THE CINCINNATI PLANER CO.
CINCINNATI 9, OHIO

And so it was from a gear-makers viewpoint that they studied the Weiss joint yoke.

To them it was immediately apparent that this yoke closely resembled a spiral bevel or spiral hypoid pinion from the standpoint of manufacture. Races were to be cut in a circular path, indexed from each other with careful accuracy and located from a fixed shoulder.

It was obvious to them that the machine needed was one which would carry a cutting tool in a perfect circle; a machine that was rugged and inherently accurate. The Gleason gear generator seemed to fit all the requirements.

That this machine was available was particularly fortunate. Chevrolet had unused machines of this kind by the score, as did every other American manufacturer who made gears. In several years prior to 1940, nearly all the automobile makers had switched from the spiral bevel type rear axle to the spiral hypoid type, and, at the advent of this change, spiral bevel

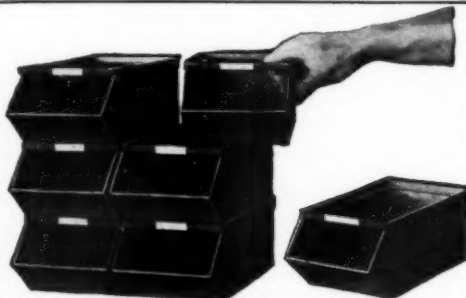
gear generators had to be replaced by new spiral hypoid generators. And while many of these older machines had been scrapped, batteries of them were still in storage thruout the country, or else were in limited use making replacement gears.

Altho the new generators offered the advantage of greater flexibility, since a change to a Keller ball point cutter was the only one needed, they still were essential to the production of hypoid pinions for military vehicles. Therefore Chevrolet made its first and only trial on an "abandoned" 15" Gleason spiral bevel gear generator. In March 1940, one month after they had been given the problem and within 10 days after they had started to convert this generator, they had manufactured the first Weiss joint they had ever seen.

The work involved in revamping 40 or more of these obsolete generators was prodigious and tools and gages had to be developed to go with the machines. Here again Chevrolet's familiarity with gear manufacture dictated the design. The cut-

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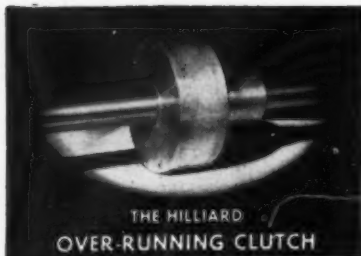
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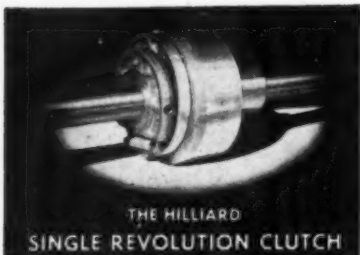
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ter form was perhaps the most tedious part of the development. Innumerable combinations of flute forms, numbers of flutes and grind styles were tried before a decision was made.

In the meantime, the other manufacturers had been working on the problem but had not solved it. Chevrolet's conversion was eagerly accepted by those firms and from freely distributed Chevrolet drawings, batteries of Gleason generators were converted to fill a large gap in the strategic machine tool line at a time when they were most urgently needed.

In manufacturing axle shafts with the Weiss joint articulation, Chevrolet makes the yoke-ended shafts completely and assembles and tests the units. The balls and pins are purchased.

Each section of the shaft is made from a cylindrical mill bar. In each, the yoke is formed by upsetting one end of the bar and drop-forging and trimming it to shape. In these operations, the yoke is formed to a spherical shape about $3\frac{1}{2}$ times the diameter of the bar. Then shoulder and face behind the head and the splines are machined and hobbled by conventional operations and the piece is ready for the machining of the races.

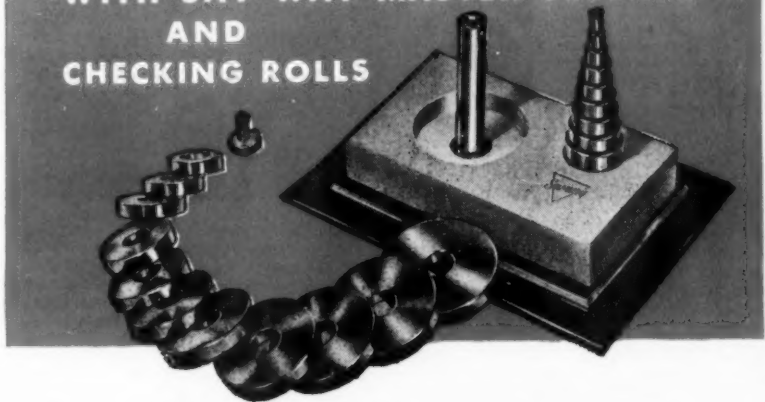
Of prime dimensional importance is the necessity that the bottom of the race be in a plane parallel to the axis of the shaft. Since the joint is pre-loaded, it is obvious that the two sides of any portion of the raceway must be parallel to maintain the preloading uniformly from end to end. The parallelism must be held in the two separate yokes of each joint, and is controlled by cutting the races in each parallel to the shaft axis. This condition is maintained by cutting the work on a zero root angle. The generators are checked to assure this condition by means of a straight bar in the arbor and an indicator on the cradle.

The indicator reads zero either side of center on passing the bar as the cradle rolls. This method is always used to check the vernier zero on any gear generator.

Of second importance is the gage dimension for the depth of the race from the central plane of the axle shaft. It is

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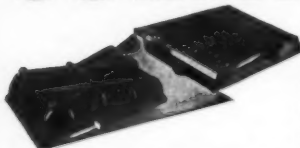


very nearly the radius of the balls and must be maintained within close limits, since any error beyond the allowed tolerances would require balls of larger or smaller sizes than the selection available to be used. This dimension is maintained by a "paddle gage". It consists of a plate offset on a shank which corresponds to

the shoulder and shank of a yoke. The face of the plate is parallel to the axis of the shank and is the depth dimension distant from the axis.

The gage is assembled into the arbor with the face parallel to the cradle's plane of roll and the cutter is advanced until it touches the face. A thickness or feeler

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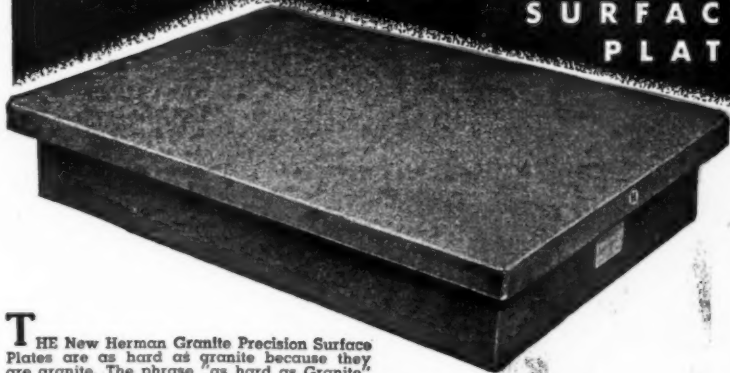
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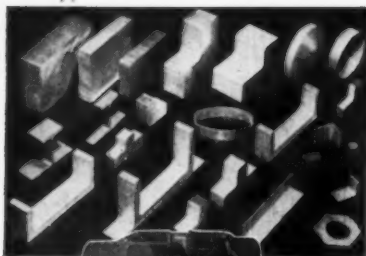
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gage is used in this adjustment. Two or more freshly sharpened cutters are used on each machine in the course of every eight hours of operation. A cutter is usually replaced in less than five minutes and the first yoke cut after this change is perfect.

It will be noted that the opposite races are parallel and that each pair of races is mutually perpendicular to the other pair. The same paddle gage controls this specification in connection with the index plate of the machine, which is indexed at 90° intervals. Two of the races are cut on one generator with the cutter in the "up" position, i.e., above the joint's center; and the other two are cut on another generator with the cutter "down".

When placed in the first generator, the rough forging is located for depth of cut.

This is called dividing the stock. Originally designed as a flush pin gage, the stock divider consists of an assembly of a movable index point, a swinging bracket and a mounting block which is located just above the arbor on the machine. To locate the yoke radially, the index point is swung down until it touches the yoke, which is then adjusted so that top of the index point aligns with the top of a button, on the upper side of the swinging bracket, thru which it passes. Stock is divided on this first cut to allow for a normal clean-up of the forging, which must be balanced perfectly to assure clearance of the yokes when assembly is operated at the maximum shaft angle.

The stock dividing for the second cut is actually an adjustment to insure that the 90° relation of these races with those machined on the first cut is established correctly. The stock divider made on this second cut (with the cutter "down") is set to the paddle gage, which, this time, is fixed with its face parallel to the axis of the cradle roll.

With the partially machined forging turned 90 degrees around in the arbor, the stock divider locates the original cut exactly parallel to the cradle roll, and, therefore, at 90 degrees to the second cut which is about to be made. An indicator is

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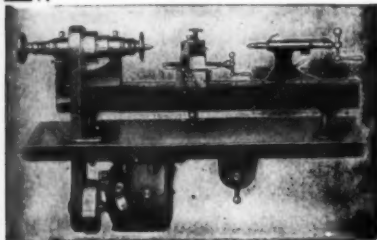
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used in conjunction with the stock divider.

With the piece established in the arbor, the massive collet is partially tightened with a heavy wrench and then the last few thousandths of adjustment are made by tapping the piece with a bronze hammer. With the collet fully tightened, the piece then is ready for the second cut.

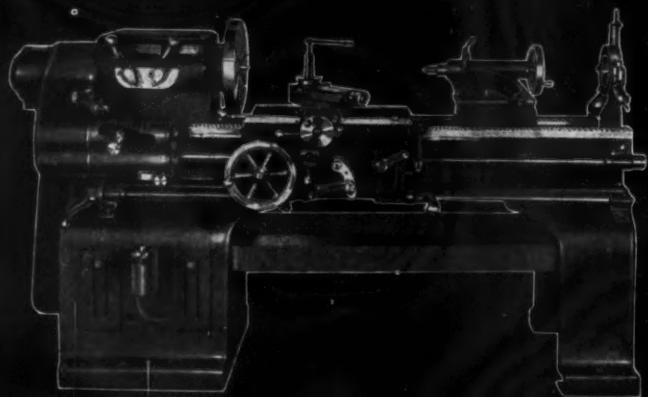
A third dimension of outstanding importance is the radius of the raceway which must be held within close limits which are identical on the two yokes going to make up any one assembly.

On a production job it is necessary to make every piece within the required limit of .004". An error in this quantity will develop a change in the torque load required to rotate the joint, since the deepest elements of the raceway, although perfect as to depth dimensions, will not be diametrically opposite thru the driving ball at every point thruout the joint's rotation.

The adjustment for this dimension is based on established gear practice and is most tedious to make and maintain. The cutter is put on the center of the cradle and its shank (or a dummy) is trammed with indicators on top and one side to establish the dead center of roll. Using indicators, because the dials, verniers and lead screws on these old machines were too unreliable, the vertical and horizontal settings are made to establish the cutter radially off the center of the cradle the required radius of the raceway. Since these machines are all adjusted to roll 30 degrees either side of center, combination of the vertical and horizontal settings also provides for the race being cut an exact radial amount at the top of the cradle roll.

The fourth important dimension corresponds to the mounting distance of a gear. In the cutting of a Weiss joint yoke, it is the distance from the face of the arbor to the center of the cradle. It is gaged, in connection with the preceding adjustment with the master block gaging the face of the arbor from the side of the cutter after tramping. While this dimension is necessary to fit the joint assembly be-

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tween the thrust washers of the wheel spindle and the joint housing when the axle is assembled, its gaging importance is to establish the seat of the center thrust ball.

A fifth dimension is the radius of the curvature of the raceway. All things else being equal, the fatigue life of a joint is very much dependent upon the maintenance of this dimension with reference to the ball diameter. It is Chevrolet's practice to cut the radius about .005" larger than the radius of the balls. In this way, the balls bear against the outer elements of the complete raceway, when the joint is assembled and clearance is provided at their sides, thereby avoiding the introduction of unnecessarily large surface stresses.

Accuracy of this dimension is maintained by a careful control of cutter sharpening and flute form, and the correction of any cutter spindle runout.

A final dimension is the depth of the center thrust ball seat which is held within a limit of .004". This limit plus the limit allowed in the mounting distance is the total limit allowed in any assembly, but location of the thrust seat by any combination of these limits makes no appreciable difference in the functioning of the completed joint.

After machining, each yoke is tested in an actual working assembly before it is released for final assembly. The "green" or "soft" yoke is assembled into a unit wherein the other yoke is a hardened one and balls of suitable standard sizes are used. While in this assembly, the yoke is manipulated or rolled to the full shaft angle in several different directions, thus

insuring uniform ball tension from end-to-end of the raceway. Once an hour, a yoke from each pair of machines is gaged to inspection dimensions and radius of curvature of the raceway is tested with a standard ball and Prussian blue. If any discrepancy is found, it is remedied immediately before production on the machine involved is allowed to resume.

After a yoke has been machined and tested, it is heat treated in the same way a hypoid pinion is treated. This is by carburizing the yoke and then quenching it, head down, in oil. Then the yoke is straightened, its back ground square, and its shoulder ground to size. In this state it is ready for assembly.

Assembly is made by workmen who select balls of the proper sizes from a selection of seven different diameters. Most of the assemblies are built up with three or four sizes of balls, despite the fact it is required that diametrically opposite balls must be of the same diameter. After the assembly has been "built up" each one is tested for ball tension and a proportion of them rolled at a 32° shaft angle.

To date, it is estimated that more than two and a half million Weiss joints have been made and Chevrolet has made more than 875,000 of them. After Chevrolet had solved the problems connected with the manufacture of the joints, it was easy to make them of consistently high quality. This has been proved repeatedly by the service records of the Chevrolet 4x4 and GMC 6x6, the GMC amphibian "ducks" and the 4x4 armored cars.

All illustrations, courtesy Chevrolet Gear & Axle Division, General Motors Corp., Detroit.

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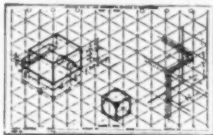


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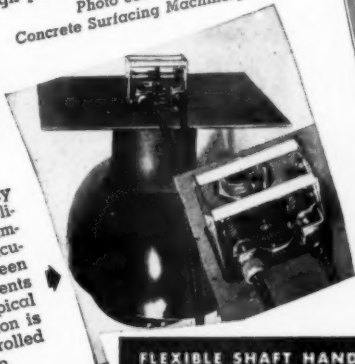


POWER DRIVE flexible shafts make practical portable tools like the Concrete Surtacer shown, where the motor is slung from the operator's shoulder. Obviously, this arrangement makes the tool much easier to manipulate and less tiring to use than the direct-connected type of tool. Remember it when you design portable tools.

Photo courtesy of
Concrete Surtacing Machinery Co.

GEARING is used in many flexible shaft remote control applications to reduce or entirely eliminate torsional deflection, particularly where the distance between control and controlled elements calls for long shafts. A typical geared flexible shaft connection is shown in this remote controlled Aircraft Radio Compass Loop.

Photo courtesy of
Radio Corporation of America



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This newly published 256-page handbook gives complete information and engineering data on both power drive and remote control flexible shafts and how to apply them. A copy, free to any engineer who complies with this provision—make your request on your business letterhead and indicate your position.

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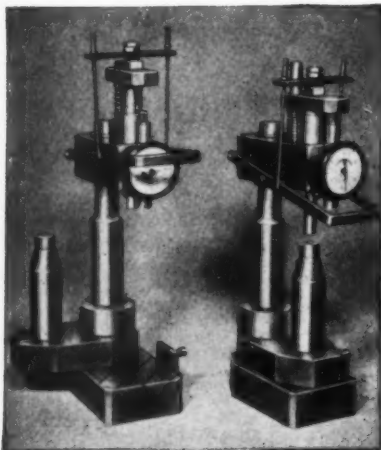


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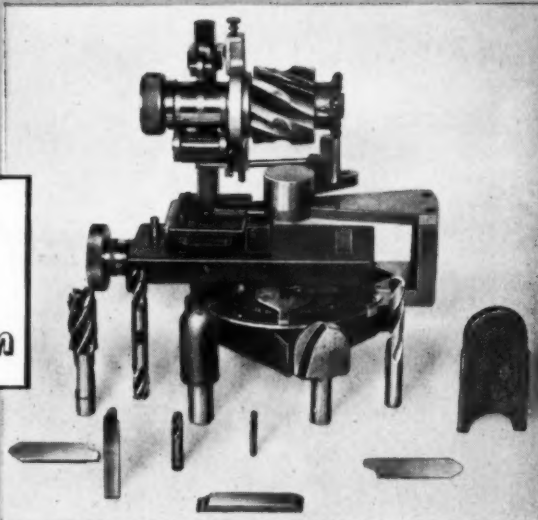


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Meyers Radiform set up to generate a radius on a helical slab mill.

Also pictured are a few standard cutting tools which have been made into "specials," on the Radiform.



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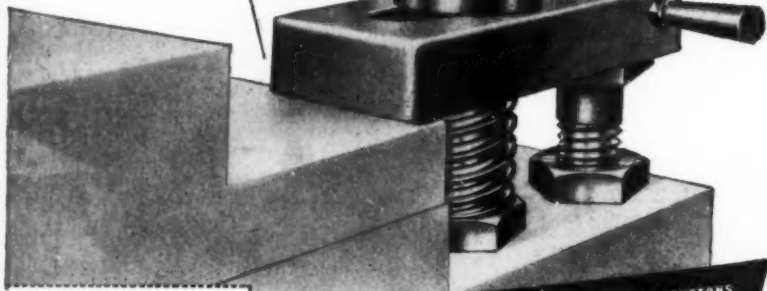
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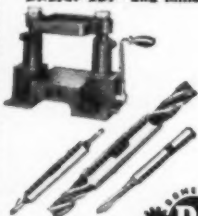


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The ART of METAL Cutting

PART III — THE CURRENT REVOLUTION IN THE MACHINING OF IRON AND STEEL

THE introduction of steel cutting grades of carbide has served dramatically to increase the machining rates on all machine tools, particularly so, however, on milling machines. Since the milling process is perhaps the most widely used and versatile of all the metal removing methods, the proper perspective of the current revolution can be maintained only by recalling, briefly, the history of the milling machine itself.

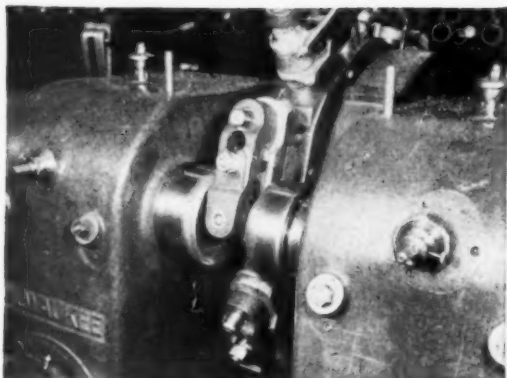
When Eli Whitney invented the milling machine in 1817, he proposed for the first time in history, the interchangeable parts system that is the basis of modern mass production. Until 1819, guns were made by gunsmiths who processed each individual part, fitting these together to

make an effective and usable gun. The cost was excessive and no part of one gun was interchangeable with any other.

In one of the most dramatic and significant moments in American history, Whitney proposed to Thomas Jefferson, then President of the United States, to invent a machine with which to manufacture guns for the Army of the young Republic on a mass production basis. Fortunately, Jefferson was not only a great statesman but a man of incredible vision in such practical matters as manufacturing. He succeeded in obtaining an advancement of financial aid for Whitney with which to carry out this seemingly fantastic proposal.



Face milling at 60" per minute—Steel SAE 9145. BHN 180-200. Rate with H.S. S. face mill cutter is 6" per minute.



Duplex milling of tractor links (steel forgings—180 BHN) is performed with Carbide tips at almost three times faster feed rate than with H.S.S. cutters (31" per. min. against 11" per min.)

At the appointed time, Jefferson and his advisors were ushered into a room. On a table were segregated in lots of 100 each, the necessary parts of guns. One of Jefferson's military aids was asked to pick from each lot one part wherewith to assemble a gun. For the first time in

all history, Whitney's method made it possible to produce an article such as a gun, with interchangeable parts.

The first milling machine that inaugurated mass production (significantly in firearms for national defense) was pow-

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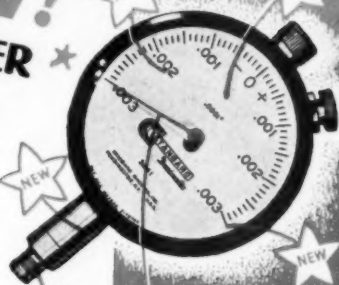
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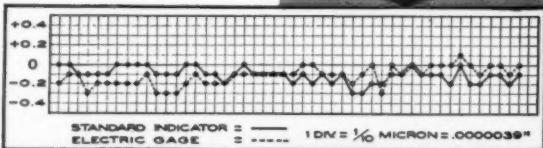
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ered, it is estimated, with less than 1/4 hp and was equipped with Carbon Tool Steel Cutters. It produced one gun while current milling machines, using steel cutting grades of Carbide could produce 1550 complete firearms of the same 1817 design. Whitney's introduction, not only of the milling machine and with it mass production, is hardly more epochal than the present-day application of the miracle cutting metal, Tungsten Carbide and its variations.

One of the most significant characteristics of these cutting materials is their ability to machine metals at hardnesses unknown and incapable of being machined until within recent months. Thus, certain manganese alloys, of great industrial possibilities, could only be cast until recently. Now they can be machined thru benefit of Carbide. An injector body, for example,—a part subject to the most devastating and destructive wear—can now be machined at 170 feet per minute—(until a few months ago it could not be machined at all)—which represents a three minute "floor-to-floor" time. And the cutter life is represented by 40 pieces between grinds—a figure that a few months ago was representative of good cutter life in relatively easily machined materials.

Pertinent to the war effort is the rough turning of 75 mm shells at 196 surface feet per minute in 40 seconds—one minute "floor-to-floor." Two and three-quarters pounds of metal are removed in 40 seconds, and 100 of these drop-forged shells are turned, complete, between grindings of the tool. During World War No. 1, a corresponding operation required 20 minutes. Thus, production in this item of war material has increased more than 20 times, or 2000 per cent.

Automobiles, vacuum cleaners and refrigerators, to mention but a few items, will be manufactured more economically and at margins that will permit paying taxes that will make possible reduction of our national debt, only if manufacturing costs can be reduced. In the steel mills, rolling of shapes, bars and plates is a cost that enters into every item of American economy. Until recently, these rolls were machined with High Speed



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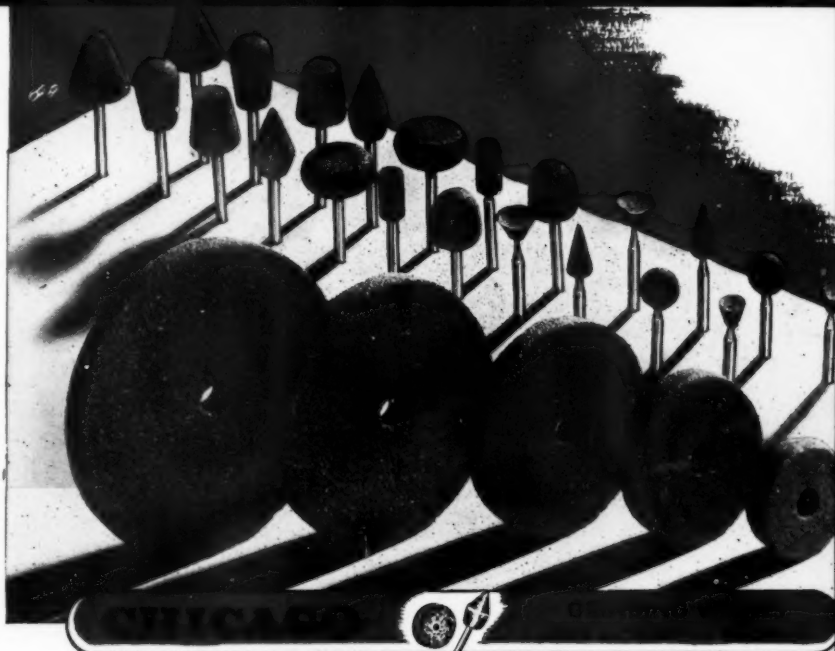
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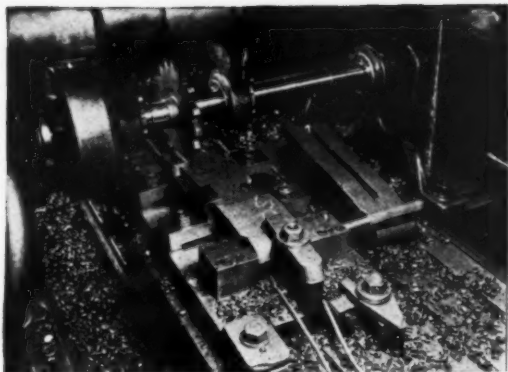
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Milling slot in SAE 4340 heat treated to 420 BHN with Carbide tips at 16" per minute.



Steel in 13.2 hours. Today, using Carbides, these same rolls are machined (turned) in four hours and five minutes. The ratio of saving is 13 to 4 or 3 to 1! This is a measure of the stepped-up tempo of the post-war era into which, let us hope, we shall soon pass.

Armor plate is extremely hard, and until recently, in the non-machineable bracket of materials. The best that could be done with this 400 Brinell cast alloy steel, that had in addition hard spots and sand pockets, was 11 feet per minute with the High Speed tool breaking down

Aber CURVED TOOTH Milling Cutters

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Each series is designed and engineered for a specific type of work and each in turn is leakproof. Take the Hansen air coupling for instance. Here is a coupling that will handle pressures from two ounces to over 10,000 pounds without a leak.

Hansen couplings are the simplest and quickest to operate, the easiest to connect and disconnect. Slight push of plug into socket, they are connected absolutely tight; easy pull on sleeve, they are disconnected.



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after 8" of wear. Carbide cutting tools machine this material at 60 feet per minute and do 31" between grinds. Thus, a 500 per cent increase in production has been achieved in this operation and the time of the tool on the machine increased almost 300 percent. (The increased time of the tool on the machine represents increased production due to less "down" time and less lost time for regrinding and retooling.

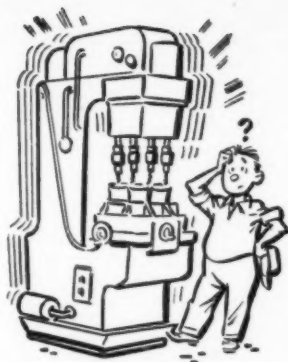
Gear blanks for milling machines are now machined with steel cutting Carbide at 500 to 600 feet per minute with 150 pieces between grinds, against six pieces with High Speed cutting tools. This represents conservatively a 400 per cent increase in production, and an increase in tool life of 25 times.

A vital airplane part of chrome moly steel was formerly milled at 63 surface feet per minute. With Titanium Carbide tipped milling cutters, this same operation is now accomplished at 632 surface feet per minute, or an increase of 10 times. The actual production in this instance was doubled.

Using the traditional method, chrome moly bars were sawed (with a milling cutter) at 1 $\frac{1}{2}$ " per minute. With carbide milling saw, this operation is now performed at 20" per minute, an increase of 15 times. The surface foot rate under the older method was 83; under the new, 833 feet per minute—a speeding up of just a little under 10 times!

Another vital aircraft part is currently being machined in less than $\frac{1}{2}$ minute with the Carbide cutting materials set up for negative angle milling. This represents an increase in production of 500 per cent, the older method requiring 2 $\frac{1}{2}$ minutes. In addition, the new technique embraces other savings such as the elimination of all coolants, and the machining of steel parts in one operation instead of two, with finishes that eliminate a subsequent grinding operation.

How far can these increases go? No one knows, the upper limits only now being explored. The milling of an aircraft part composed of a tough chrome moly steel is now being performed at 2500



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surface feet per minute! "The sky is the limit", or should we say the limit is only what man's imagination places upon these operations.

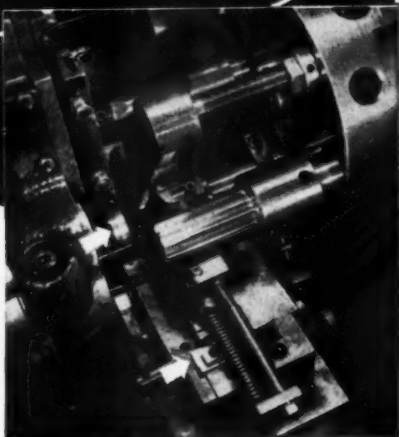
Perhaps the outstanding example of what can be accomplished with the new negative angle milling technique using Carbide milling cutters is typified by the slotting of an airplane wing hinge—a delicate operation calling for the closest tolerances and perfect finish. This SAE 4140 material was formerly slotted by means of four operations that required 75 minutes. The new technique and metal-cutting materials have reduced this operation in two minutes! These speedier operations currently being performed in the aircraft industry will, of course, be carried over into peace-time operations and post-war industries. The manufacture of the equipment, devices and materials Americans will demand in such huge quantities after the war will be produced at greatly reduced costs and tremendously increased efficiencies.

Aircraft parts, particularly such vital and critical fittings as the so-called hinges that couple or tie the wings of the planes to the fuselages, must be machined with mirror-like surfaces free from all scratches, even the slightest blemishes. This can now be accomplished in the milling operation without subsequent grinding which would require considerable time and equipment. Thus, the hinges used on our fighter planes are being slotted to unbelievable tolerances in one operation with Carbide slotting cutters using negative angles. Formerly, this operation was performed in a roughing cut at 40 feet per minute—the material is almost glass hard, 402 Brinell; the surface foot rate is now 564 feet per minute. The feed rate, using High Speed Steel Cutters was $\frac{1}{8}$ " per minute; it is now $\frac{1}{16}$ " per minute, and in this one operation the slot is milled perfectly, thus, eliminating the roughing cut and subsequent grinding and hand finishing operations. In addition, this slotting is performed without benefit of coolant and, thus, another item of expense has been eliminated. The production of aircraft hinges has been increased thru the use of this new technique and these Titanium Carbides four-fold or by 400%. It is little wonder that American industry has accomplished the impossible and is

*Looks
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**These gun part components
were never made complete
in one operation until
CLEVELAND AUTOMATICS
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They look like simple rings that anyone could whittle off in a hurry, one with a beveled face outside, one with beveled recess. But . . . they are required to nest accurately in sets . . . tolerances are close, including extremely precise concentricity . . . and 5150 modified steel tubing was specified. Cleveland tooling engineers found the answer, with ingeniously cammed, double action tool fixtures which automatically turned the desired contours at an unmatched production rate. The fixture for processing the male unit is shown above. Lower arrow indicates contour cam mounted on cross slide which guided transverse action of spring-loaded skiving tool (upper arrow) as lateral action was imparted by pusher mounted in turret. Other ring was fashioned with same principle, differently mounted. This is typical of the increased range which modern tooling imparts to the known versatility of Cleveland Automatics. And

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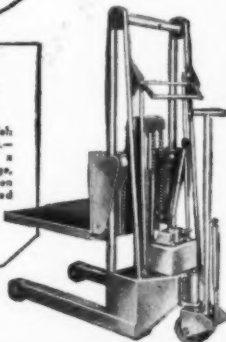


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Material Handling Equipment
Engineered Hydraulic Devices

currently performing miracles of manufacturing.

A rifle part was formerly milled with High Speed Cutters at 79 surface feet per minute. Currently, this same piece is being milled with the new technique at 302 feet per minute. The cutting time has been reduced from 90 seconds to 30 seconds, which means that three parts are now produced where formerly only one was made available.

In the final presentation that follows, the remarkable advances made in the machining and processing of such non-ferrous materials as aluminum, magnesium and plastic materials will be discussed. The Carbides have revolutionized this field of cutting, just as they have the ferrous materials—only more so. Aluminum and similar non-ferrous metals and plastics are now being machined at rates that a few years ago would have seemed high for the woodworking industry. Today, the hardest and toughest of the aluminum alloys such as Dural is being machined at wood speeds.

(Data supplied thru courtesy, Research Dept., Wesson Co., Detroit (20) Mich.)



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Illustrated are a few of the many adaptations of the famous KRW Hydraulic Press which is doing a variety of pressing, forming, bending, straightening and closing operations for industry.

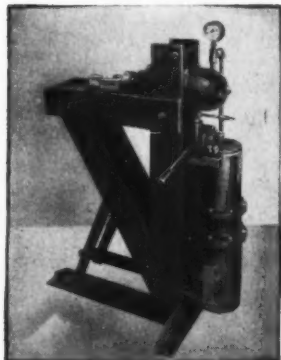
KRW Presses are adaptable to literally hundreds of special jobs. Using low-cost dies, manufacturing costs on many items are greatly reduced. Using air pressure varying from 100 to 225 pounds, the resulting hydraulic pressure varies with the air pressure used. A built-in air regulator permits exact duplication of pressure on every stroke . . . this

is important on many operations. KRW Hydraulic Arbor Presses are available for either vertical or horizontal operation or specially built to handle a particular operation.

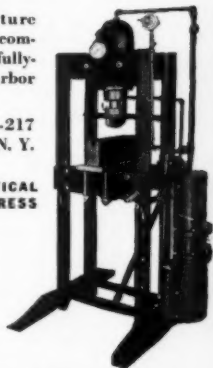
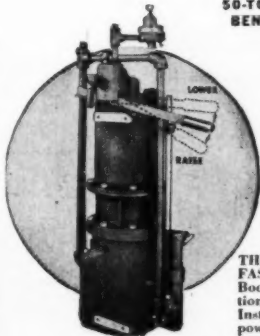
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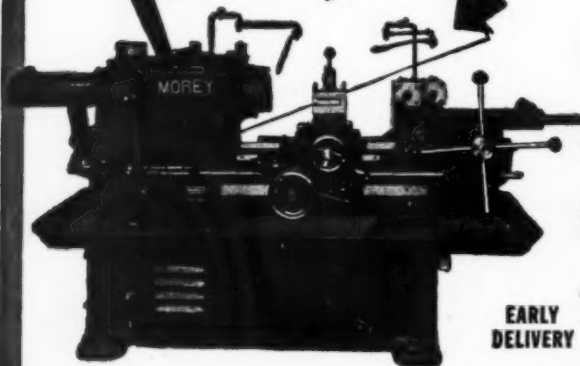
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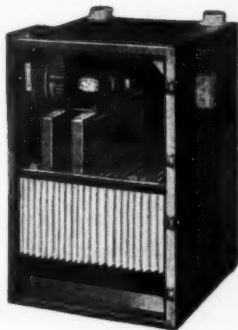
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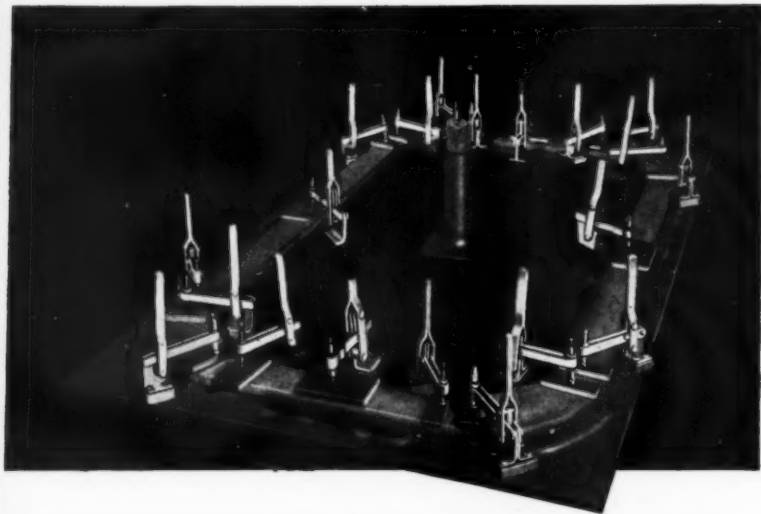
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When parts must be held together for such operations as welding, drilling, fabricating, etc., Knu-Vise Toggle-Action Clamps speed production, for no time is wasted screwing down and then unfastening holding devices. One quick motion accomplishes either in an instant.

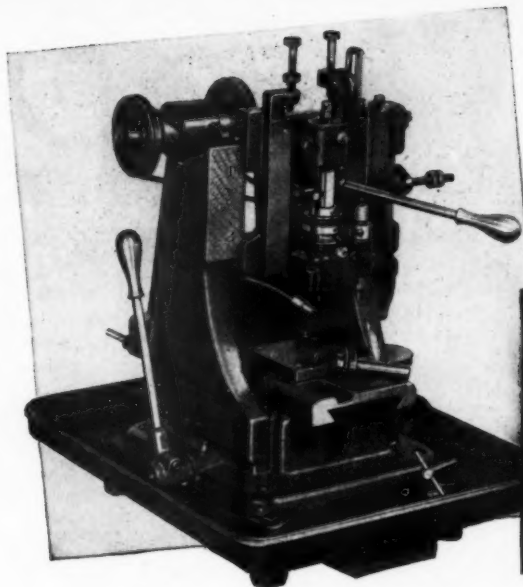
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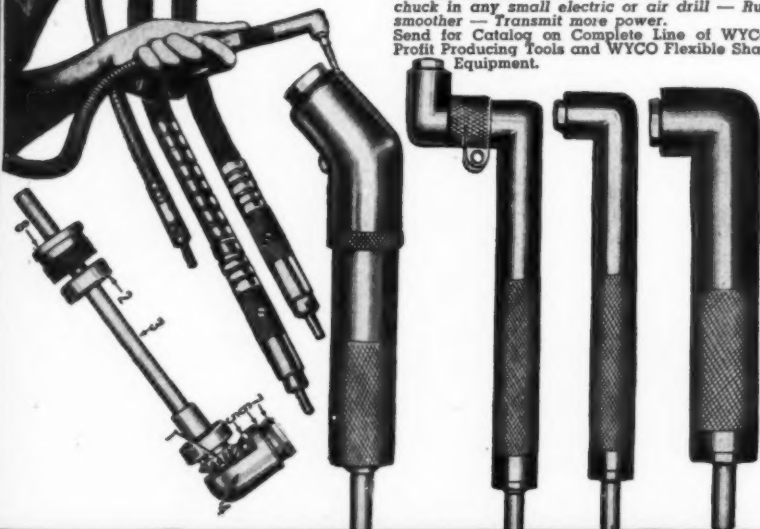
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YOUR TAX PROBLEMS

TAKE AN INVENTORY OF YOUR INVENTORY

By ARTHUR ROBERTS

INVENTORY is an important element in computing the income tax. Because its computation is not so definite and more involved than the calculation of salaries or cash in bank, inventory should be given more consideration than it usually receives. Otherwise, it is easy to "get off the beam" on profits because inventory is calculated incorrectly, many may pay more income tax in a current year for the same reason. The subject therefore rates exploration.

Like depreciation, the calculation of inventory requires good judgment because the book value of these accounts may not be actual value. Like depreciation, there are numerous ways to figure inventory: — first-in, first-out, last-in, first-out, (popularly called "fifo" and "lifo" methods), average cost, basic or normal stock, retail inventory, cost, and cost or market, whichever is lower.

Some of these methods work all right in some organizations and all wrong in others. The baby of them all is "lifo", created to level off the peaks and valleys caused by an increase or a decrease in the market value of materials at the end of a period when inventory is taken. A businessman may do a good managerial job thruout the year and then along comes a dip in market prices. If he has a sizable inventory, he may have a sizable loss, which reflects itself in a low profit, when, by all rules of the game, he should have registered a good profit. "Lifo" was created to stop this but the war came along and played havoc with the plan. Users of machine tools have asked us about "lifo" and we can only say that it is a more involved procedure that gets the same answer in the long run as a simpler routine, and is just as likely to give trouble. The essence of good accounting is simplicity. The test is whether

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your system reflects true profits and permits adequate business control.

There are 10 important things to remember in connection with inventory valuation:

1—Value inventory by the same method at the beginning and the end of a period. Be consistent from period to period.

2—List all items on inventory sheets, quantity, price and unit, also location. File these records for future reference. Have one man record items and another check his work to assure accuracy. Extension and pricing should also be checked. Do not include items for future delivery to which you have not taken title. Include any item to which you have title even tho in transit or not on hand.

3—See that the method used clearly reflects income. If you over-cost inventory, profits will be higher; if you under-cost inventory, profits will be lower—on paper—but the income tax will vary in real money.

4—You cannot change from one method to another without consent of the Commissioner of Internal Revenue.

5—Take inventory as often as possible. Annual inventories in these fast-moving days, and in the post-war tomorrow, when prices, at one time or another, may fluctuate widely, are hardly likely to show true profit or supply adequate information for cost control. Quarterly or semi-annual inventories are recommended from now on—or stagger the count, so much each month.

6—Estimated inventories for the monthly profit and loss statement are just estimates; hence, the monthly net is also an estimate. Monthly statements are prepared to keep businessmen appraised of the trends of operating ratios and profit, information of great importance, even tho profit is not computable to the dollar. You should know which way your business is heading from month to month because that is the only way you can affect maximum cost control and assure maximum tax economies.

7—Any change in inventory valuation will change the cost of sales ratio for the period and obscure your comparative anal-

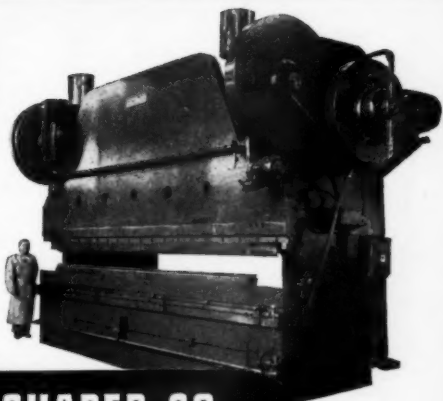
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This new, patented diamond tool holder provides a fast, accurate method of meeting every requirement in dressing and truing operations. Equipped with internal coolant ducts for wet grinding, and external cooling fins for dry grinding, metal setting as well as stone are kept at safe operating temperatures, eliminating diamond breakage, due to overheating. Thus, tool life is increased, resulting in savings from 30 to 50%.

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ysis from period to period unless you show the re-valuation of inventory as a separate listing on your records. It may also affect your costing routine if the increase or decrease in inventory valuation is substantial.

8—The only way to get an accurate inventory figure is to take a physical count of the items in stock. Adjust your book figures to agree with the actual count when you take inventory. The Bureau of Internal Revenue may question your book value on inventory unless you take a physical count at reasonable intervals. If your books are kept in accordance with good accounting practice and you take a physical count periodically, the book figure on ending inventory is acceptable on your tax return, providing you record the actual cost of the materials purchased during the taxable year, credit the materials used, and include inventory at the beginning of the year at actual cost.

9—A stock control system helps keep inventory in the groove. The lack of stock control causes many businessmen to go wrong on inventory valuation. Others confuse a stock control system with a perpetual inventory or use the information on this record to compile the inventory count. Wrong! A stock control system polices the movement of stock from receipt to customer. It minimizes loss and provides valuable data on stock-turn, waste, spoilage, and other inventory losses, maximum and minimum quantities on hand to aid in making intelligent purchases, minimizes "outs", prevents a tie-up of excessive capital in stock on hand, etc. It is a cost control record, not an inventory.

10—Separate unusable materials because of defects of any kind and list them at actual value. By reducing the cost of such items to real value, you get the benefit of a tax deduction and take a loss when realized. Otherwise, your inventory on the profit and loss statement and balance sheet is inflated; likewise, net profit and net worth.

Materials of this type should be valued at a reasonable basis considering their condition and usability but never less than scrap value. The Internal Revenue Code states that depreciation does not apply



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The Peerless Standard is made in three sizes: 6 x 6 in.; 9 x 9 in.; 13 x 16 in. Belt or motor drive. One or three speeds. All have automatic feed to compensate for hard spots—positive clearance on return stroke—gauges to limit height of saw-frame lift on return stroke. Mail the coupon — *now!*



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to inventories but inventories can depreciate just the same. You cannot take this depreciation deduction the same as on fixed assets, but you handle it thru inventory valuation.

To equalize losses on damage, waste, spoilage, etc., thruout the year, some businessmen scan their experience figures, determine the average yearly expense, then charge it off monthly but, as such, it is not a permissible deduction on the income tax return because the Treasury Department wants the actual loss as shown thru the inventory records.

Of the various methods used to value inventory, cost or market, whichever is lower, is probably most frequently used. Market value means replacement value. Some accountants debate the fairness of this method, contending that it is inconsistent, that it writes down inventories when the market value is below cost and does not write them up when the market is above cost. However, conservative accounting demands that profits be not anticipated; that a loss has actually occurred if the inventory can be replaced at a lower value and the current period should stand the loss. Some accountants are always trying to find the elixir to eternal profit but "there ain't no such animal." Recording the figures in a different way, as is done under the different depreciation and inventory methods, gets the same result in the long run. Therefore, use the simplest method suitable to your business and recognized as good accounting practice. Cost or market, whichever is lower, is one of the methods prescribed by the Bureau of Internal Revenue and has merit. During a period of rising prices, cost is the inventory valuation; in a period of decreasing prices, market or current bid price for the materials prevailing at the date of the inventory. Cost is the invoice price, less trade or other discounts, plus incoming transportation and other charges incurred in acquiring the goods.

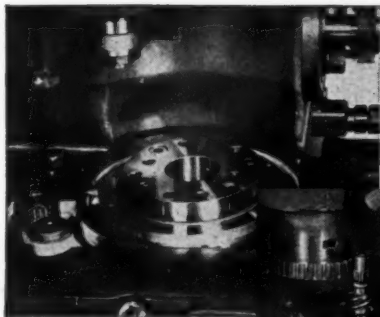
CAPEWELL SPANISH CATALOG

Now available to the Spanish trade is a 24-page booklet on hack saw blades issued by the Capewell Mfg. Co., Hartford, 2, Conn. The various types of blades are illustrated and described and diagrams showing the correct methods of sawing, as well as types of teeth are included.

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With the Automatic Indexing Mechanism installed on this Fellows 7-Type Gear Shaper, the production of straight-sided splines, external and internal, becomes a simple operation. An added economy results from long tool-life.



economically, than competitive methods. Put the Gear Shaper in your shop . . . from that time on you'll get a fuller money's worth from both your men and your machines.

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This light is now being adapted to many other uses than with rip-saws. Consider it for some of your tough lighting situations.



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Yes, you can rely on the performance of a Marshalltown Press—they give you the most for your money, because they are engineered and built for dependable trouble-free service. Features include — more die space, chrome molybdenum cranks, wrist pin connections and many other proven advantages.

Write today for literature about Marshalltown Presses — available in capacities from 5 to 70 tons.



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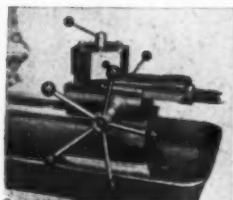
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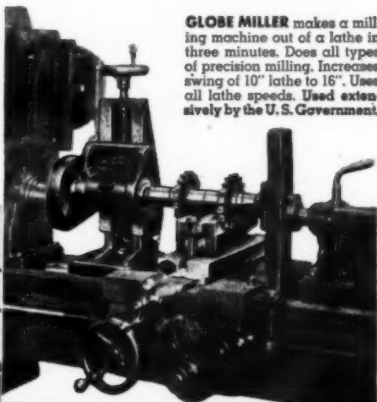
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GLOBE CROSS SLIDE. Adaptable to any lathe. 3 1/4" travel. Rugged construction.



GLOBE MILLER makes a milling machine out of a lathe in three minutes. Does all types of precision milling. Increases swing of 10" lathe to 16". Uses all lathe speeds. Used extensively by the U. S. Government.

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MILLING VISE (below) with replaceable jaw plates. Jaws 3 1/2" wide, 3" opening, 1 1/4" deep. Larger sizes available.

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Precision built. Various sizes available.



Milling arbors. 4", 5", and 12".



WORK HOLDING FIXTURES, hold work of various shapes for milling, drilling, shaping or grinding.

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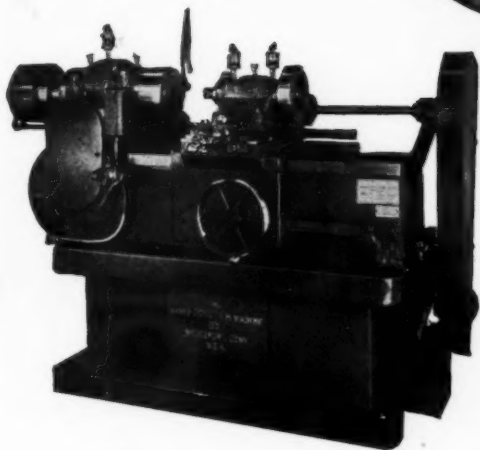
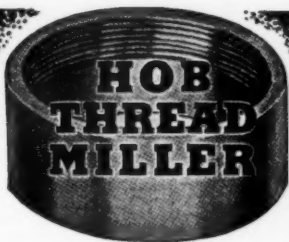
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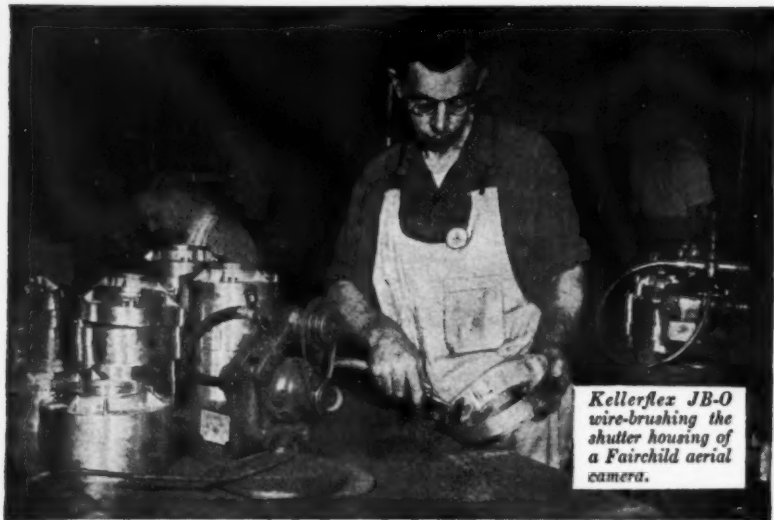
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DUPLICATION OF
RIGHT OR LEFT
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Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chucks, or special face plate fixtures . . . can be threaded on this machine.

Set cam-controlled automatic cycle on first piece. Thereafter, cutter feeds into work to proper depth and at correct pitch and withdraws when cut is completed. Work and cutter spindles are driven by individual motors through worm drive, affording ample power throughout the wide range of speeds and feeds.

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wire-brushing the
shutter housing of
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for finer, faster production at lower cost

The Kellerflex J-O, smallest of the Pratt & Whitney line of flexible shaft machines, is a high-speed machine particularly designed for work with small grinding wheels and gem points as well as fine burs. It is of great value for small bench work such as burring or sanding aluminum castings, touching up dies, moulds, tools.

This versatile labor-saver is such an improvement over the old hand methods that operators frequently refer to it as "mechanical muscle." And it will work all day without heating up or getting tired.

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THE FOREMANSHIP FORUM

By Edmund Mottershead

THE TECHNICAL SIDE OF FOREMANSHIP

AS American industry moves on into another year of war, we can look back at many months of substantial achievement. A production miracle has been achieved but in total war, super miracles are demanded because shortages of war materiel often mean heavier casualty lists. Everything possible is being done to meet the shortages of skilled labor by various training programs, and while in certain areas the labor shortage is acute, employers are devoting more attention to the problem of selecting and developing new foremen and supervisors and improving the work of the men already in these jobs. The end result of all this is more efficient use of the available labor.

Our ability to utilize all available labor resources to the utmost depends largely upon the caliber of our industrial "non-coms", the supervisors, foremen, and leadmen. And our ability to reconvert to the production of peace-time and civilian products when again we can think freely

of such things, will depend upon the ability of these same men to plan and manage, supervise and train, and lead men.

In meeting the skilled labor shortage, skill itself has been broken down and analyzed for training purposes. We find that there are essentially three types of skill:—muscular, sensory, and thinking. We have found ways to train muscles, to coordinate the senses in action, and to make ideas and understanding grow in the minds of the workers. From this we have developed ways and means of up-grading workers so that with minimum delay, they are working at their maximum skills in the types of work for which they are best suited.

The objective of such skill analysis has been to isolate and identify the muscular, sensory, and mental phases of a job and to so relate them in a progressive pattern of learning and training that the learner will proceed from the known to the un-

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For GAUGES, TOOLS, DIES, etc., with tremendous TIME SAVING. These factors make STAR DUST indispensable in lapping and superfinishing on HARDSTEELS, TUNGSTEN CARBIDE, CHROME.

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known, and from the simple to the increasingly difficult and complex.

Let's apply this reasoning to the problem of obtaining capable foremen and supervisors. In place of muscular, sensory, and thinking skill as such, the foreman's job requires technical, executive, and dynamic skills.

By technical skill I mean essentially the foreman's knowledge of the jobs in his department. Preferably, he should have performed all the jobs in the department which he is required to supervise. Most often, the foreman has not performed all, but most of the jobs. Occasionally we find a man who has been made foreman or supervisor who actually has technical knowledge of only one of the jobs, or even none of the jobs, but who has been made foreman because of his other abilities.

He should be familiar with and experienced in the use of all of the tools of the welding trade, not only hand tools but all the power equipment.

He should be better informed on any of the jobs than his workers, and be able to show them the practical short cuts for efficient work. The quick and skillful use of hand tools—the correct, economical, and safe use of power machinery of all kinds—the care and maintenance of machinery, and the care and sharpening of cutting tools are all essential to each worker. It is the foreman's responsibility to see to it that the workers are correctly informed and also properly taught and supervised so they actually employ the best methods in using tools and performing their jobs.

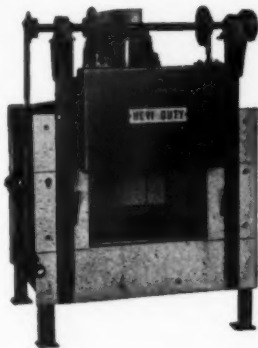
The foreman's knowledge of materials is also an essential part of his technical equipment. He should know what material is used for each purpose, relative strength, wearing qualities, comparative ease of machining, etc. Reinforced with this knowledge of materials and accessories, the foreman not only has an opportunity to make valuable suggestions as to design and specifications for products to the actual product designers, but also to suggest suitable materials and to find economical methods of production using those materials. He has also the oppor-

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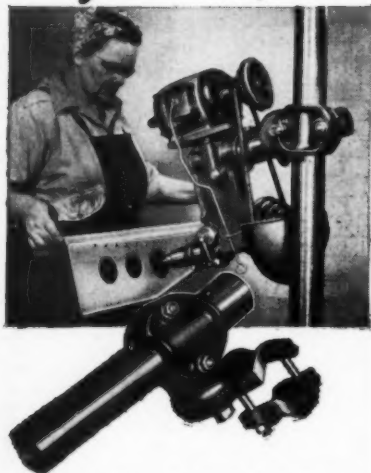


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tunity as well as the responsibility for instructing the workers as to the most economical way to use the materials and the most efficient methods of working with them.

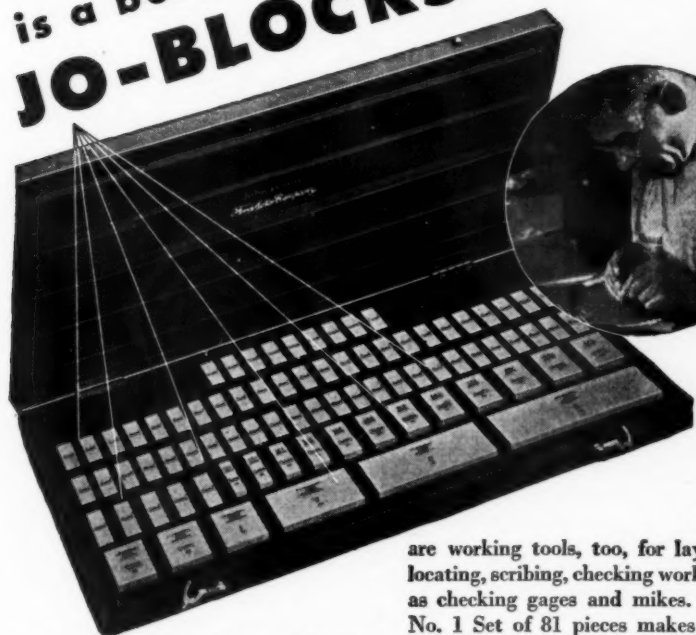
The foreman's skill as an instructor is an important part of his technical equipment. Regardless of his knowledge of materials, of tools, of machines, and methods, there is a special skill required in imparting his knowledge to workers in such a way that they quickly understand it and readily make a habit of the muscular and sensory skills required in performance. To prepare himself as an instructor, the foreman needs to do two things:—he must first break down each job he is going to teach, and he must second, have a definite method of instructing workers.

Breaking down each job is a fairly simple matter. It requires only the writing down in sequence of performance, each of the steps or operations the worker performs, and accompanying each step with a brief notation of the essential things to be remembered about how to do that step . . . the "key points".

The method of instructing the worker may vary to fit each individual case, but in general, it embodies four parts:— (1), putting the worker in the proper frame of mind to receive instruction, by putting him at ease, making him realize the importance of the work and the need for doing it carefully and well, and finding out how much he already knows; (2) showing him how to do the work, carefully explaining each step in the job and asking questions at each step to be sure the worker understands it; (3) by having the worker do the job, correcting his errors, and by then having the worker do the job again and explain what he is doing as a final check on his understanding of it; (4) by having an adequate follow thru and supervision of the worker from then on.

Both the job break-down method and the instruction method mentioned have been worked out and systematized by the Training Within Industry Division of the WMC, and are made available free of charge to all war industries. The ac-

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Certainly, a good mechanic will "feel his way" through a job with all the accuracy it calls for. But he'll do it faster, with more sureness, more pride in the result and less worry over possible errors if he's got JO-BLOCKS to work with. The super-accuracy of Johansson Gage Blocks (to .000004 or .000008) is positive insurance that your coarser tolerances of thousandths or "tenths" can be maintained. And JO-BLOCKS

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tual course of instruction consists of five sessions of two hours each, there usually being 12 men in a class. Results of this training and of the application of these sound principles of instruction to the problem of breaking in new workers have been phenomenal. Any local WMC branch can tell you where to get further information about this program.

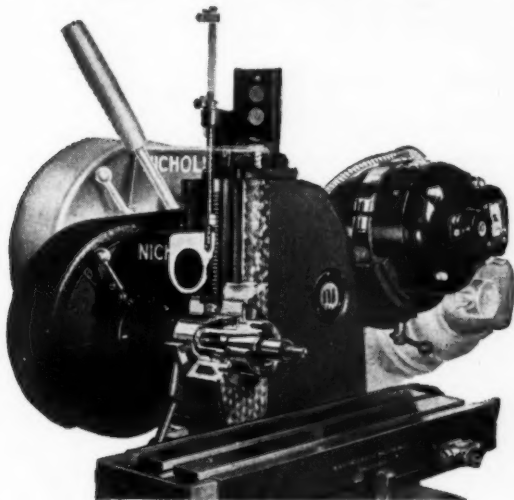
The foreman should know enough about the work, not only to teach and to supervise, but also to be able to tell when any of his workers is or is not turning out a fair day's work. In connection with this, he should have some knowledge of rate setting, wage scales, and if possible, of time study.

Someone has defined a foreman as a man with the various temperaments and skills of a slave driver, cost accountant, policeman, efficiency expert, labor lawyer, small loan shark, engineer, mechanic, time study expert, practicing psychologist, housemother, father confessor, and wet-nurse. Certainly both the duties and the skills required are many and varied. However, just as we recently examined the foreman as a man, and worked out a method of self analysis for self improvement, in considering the technical side of the foreman's job we have similar need for analysis.

We have already pointed out that there are three phases to the foreman's job:—technical, executive, managerial. A good way to get a better understanding of the whole job, and especially of the technical side of it, is to sit down and write out your own description of your job. Just list, first of all, everything you do in one column, and everything you think in a second column parallel to the first. Take any typical week and go thru it in your mind day-by-day. When you are finished, you will have quite a list, no doubt. Now take three blank sheets of paper, and label them "technical," "executive", and "dynamic". Pick out from your first list everything you do or think which pertains to the technical side of your job and list it on the sheet headed "technical". Do the same for executive and dynamic functions.

Now that you have a list of the things you do and think in the technical phase of your work, go over each point with four questions in mind:

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1—What training and information do I have on this?

2—What practical job experience do I have on this?

3—Am I able to each this?

4—How well do I supervise workers on this?

The purpose of this exercise is not so much to rate your own performance as it is to actually think thru each aspect of the technical phase of your job, to find out the limits of your understanding, some of your strong points and weak points, and if possible to pick out some of the things you need to do to improve your technical ability.

It is essential to keep in mind that regardless of old-fashioned thinking and pre-war methods of operating and doing business, the large mass production industrial organization is the typical social unit of our day. The type of thinking and the technical skill and knowledge which makes possible the successful operation of a large industrial organization is equally necessary to the successful operation of a company employing only three or four men. The same functions must be performed; the same planning must be done; and the same skill and knowledge must be brought to bear on the problems of production. The only difference is that in the large organization, one man will specialize more on a less widely diversified range of duties. If anything, the foreman in a smaller plant must be more highly skilled, must have more technical knowledge, and must be in every way a bigger and more competent individual than the foreman in a larger organization.

With this thought in mind, examine carefully the technical phase of your job as suggested.

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Model FA Air-O-chek Air Gun available with $\frac{1}{8}$ ", $\frac{1}{4}$ ", $\frac{3}{8}$ " or $\frac{1}{2}$ " pipe thread

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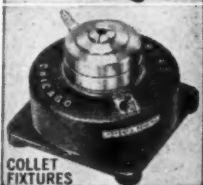
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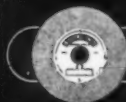
Everything must be as perfect as possible about the grinding wheel we make for you—grain size, structure, bond, shape, and size of wheel must be exactly determined to meet your job demands. This makes necessary careful analysis of your grinding needs, and that is where Sterling engineers come into the picture. Backed by years of extensive experience in all kinds of plants, the Sterling engineer is well equipped to recommend the wheels you need for every type of operation.

Write us today . . . we cannot wave a wand and produce the wheels you need, but you will be pleasantly surprised at the speed with which you receive them.

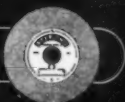
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 THE WHEELS OF INDUSTRY



Let's Talk Shop

SPECIAL COUNTERBORING EQUIPMENT

By JOSEPH E. SANSIG*

BEFORE the war, steam turbines of various size were built in small quantities only, which did not warrant much special tooling. Therefore, the machining of valve seats in the steam chests of the turbine cylinders was done in a series of single operations with standard tools such as drills, reamers, counterbores and fly cutters.

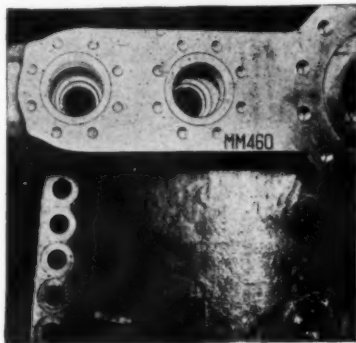
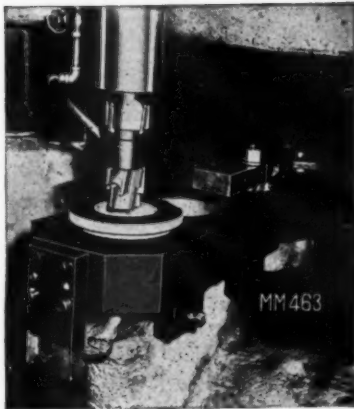


Fig. 1 (Part MM-460) shows two finished valve seats which are machined in line thru two sections of the steam chest. The external section is a $3\frac{1}{2}$ " reamed opening with a $4\frac{1}{8}$ " counterbore and the internal section is a $2\frac{1}{2}$ " and $2\frac{7}{8}$ " compound ream with a $3\frac{1}{2}$ " counterbore. These operations, when done by the old method, required the full time use of one drill press to maintain the required production with quite a high percentage of



defectives that had to be rebored for oversize valve seats.

Special counterboring and reaming tools have been made to do this job. After the excess material is removed, a cut is made with a special roughing tool. Fig. 2 (MM-463) shows a special finishing tool, with the drill jig in place, about to take a finishing cut on all surfaces at once.

This new method requires less than one shift a day to maintain production to schedule with a nearly total elimination of defectives.

Merchant Marine Division, *Westinghouse Electric & Mfg. Co., Philadelphia, Pa.

CARBIDE GAGING FINGERS

Use of carbide gage fingers has insured accurate gaging during grinding at a large aircraft engine plant in Detroit, under conditions which would wear steel fingers away so rapidly that the operator



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Button dies quickly changed.

Less set-up time. Low cost.

Accurate speedy thread cutting is assured with these DIE HEADS. A wide range of capacity of each size die head means a small investment, and makes this modern DIE HEAD the ideal general purpose thread cutting tool. For tough threading jobs where constant uninterrupted operations are essential, the BHICO DIE HEAD will do them.

No fussy adjustments to be made; Dies removed by loosening of two screws.

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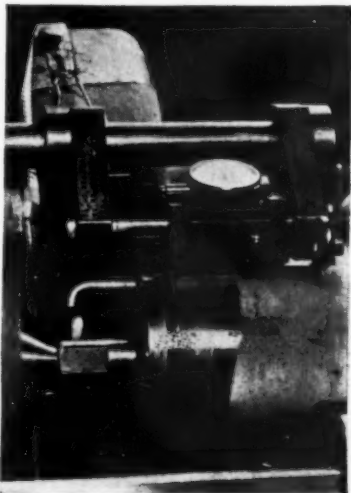
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would be forced continually to re-set his gage.

The job where these fingers are used (shown) consists of grinding the O. D. of aircraft cylinder sleeves to extremely close tolerances. The gage fingers—made of Carboloy cemented carbide where they contact the rotating work—are so set that when the gage reads "0" they automatically shut off the machine feed, thereby saving an appreciable amount of time on long production runs.



Since no lubricant can be used on these gage fingers for obvious reasons, it is impractical to employ steel for this purpose since steel would wear away rapidly. The Carboloy fingers, however, stand up under these conditions and are reported to have made this type of gaging fixture practical with a resultant material increase in production.

ODD LENGTH SPACING

By H. F. WILLIAMS

For the shop man who is required to lay off a piece of work with even spaces that cannot be accomplished with a plain scale and dividers, this method will save him much time and aggravation. If for example, a space of 4-13/16" is to be divided into six even spaces the natural conclusion would be to divide 4-13/16" by 6 making .80208".

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increases production
450%*

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bushings...*



*4½ per minute
instead of
only 1 per minute*



They used to hone one bushing per minute—and then clean out left-over abrasive. Now they finish-ream 4½ bushings per minute, mirror-smooth to close tolerances. Removable blade segments easily removed and may be resharpened 8 to 10 times—replaced when worn out. Dual Spiral blades plus 500% greater expansion, multiplies life of the Lempco Reamer many times that of an ordinary reamer. Flutes spiral in opposite directions simultaneously. Perfect for reaming over oil grooves or keyways. Good delivery.

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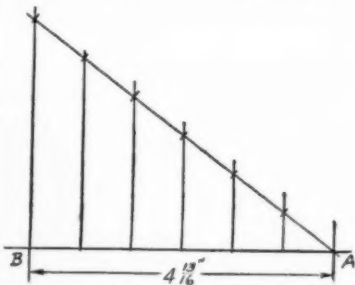
Please send illustrated booklet describing the Burgess Acousti-Booth.

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This figure is then compared with a decimal equivalent chart and found to be approximately $13/16"$ or .8125. He then proceeds to set his dividers as closely as possible to just below $13/16"$ and steps it off. Invariably he must try this a half dozen times until he hits it "right on the button" getting six evenly spaced parts.



Of a number of shop men and also mechanical draftsmen that were quizzed on this problem, it was surprising to note none knew the method explained. In the study of geometry there is a well known rule for dividing a straight line of any length into any number of equal parts that cannot be conveniently measured with an ordinary scale or rule.

In the figure, the space of $4 \frac{13}{16}"$ is laid off on the horizontal line. Using point A at the left as a pivot at which to set zero on a scale, the scale is swung upwards until the 6" mark coincides with the line at B erected perpendicular or at right angles to the horizontal line. The 6 spaces are then marked off on the angular line to coincide with the inch marks on the scale. From each of these marks a line is dropped down to the horizontal line each of which is parallel to the perpendicular line at B.

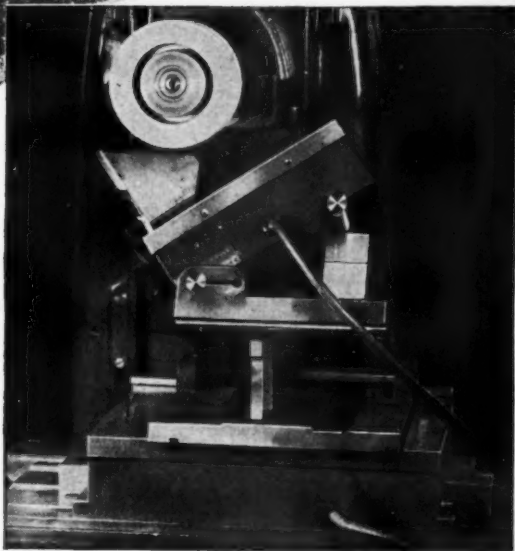
This rule applies equally well to a large number of spaces, for instance a line 8" long having to be divided into 35 equal spaces. Here the nearest fraction to be contained in a number slightly larger than 8" is $1/4"$ when $35 \times 1/4"$ equals $8 \frac{3}{4}"$. If laid out as directed, the divisions $8 \div 35$ or .22857" will be easily obtained.

Shop layout men will find this method of particular service in all linear spacing. Draftsmen working with a drafting machine or even with the ordinary tee-square and triangles can quickly divide given distances into equal spaces. The greater the number of evenly spaced parts in a line the more time is saved.

40 Seconds

**REQUIRED TO
MAKE THIS SET-UP**

**with
The
MAGNA
SINE**



That's all, just 40 seconds after he had read the angle on the print the machine operator had looked up the proper gage block in the Magna Sine Table of Constants and had placed the block in position. By simply placing the work on the table and turning the switch he is ready to grind. That is all there is to any angular set-up with the Magna Sine. To make a similar set-up with a sine bar and conventional methods would require at least 1½ HOURS. And the Magna Sine set-up is more accurate and more secure than a set-up requiring the use of clamping devices.

The time saved by the use of the Magna Sine will more than offset its cost in a few days where an average amount of angular grinding work is done. Write today for full information on how you can increase the efficiency of your grinders and other machines requiring angular holding devices.

The Magna Sine is available in two sizes and two models. The Non-Magnetic Robbins Sine Plate of the same design and fine workmanship is also available.



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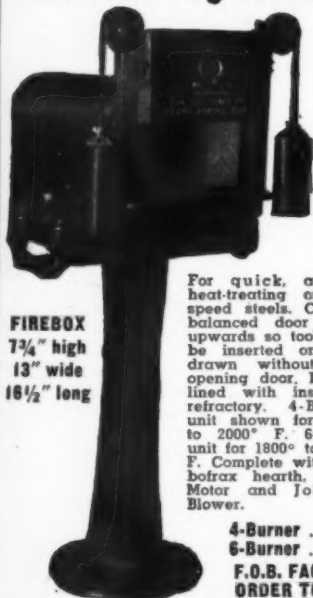
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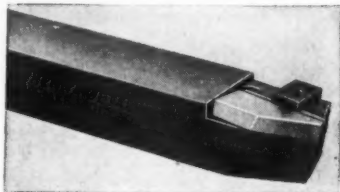
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"H-D" CLAMPED-ON TOOLS

Kennametal Inc., Latrobe, Pa. is now producing a line of "H-D." tools having clamped-in and advanceable Kennametal tips, for heavy duty machining on steel castings, forgings, bar stock, and cast iron. The H.D. design has been made possible by development of heavy-duty Kennametal tips, that, while overhanging the tool shank by about 1/16", have ample strength to take heavy feeds and depths of cut.



The special type of Kennametal tip used in the H.D. tool has a clamping shelf along the top of the side opposite to the cutting edge. It is diamond ground on the under side. When dull, the tip is advanced, and resharpened. The tip may be reground many times, since it is advanced to the front and side, in the oblique recess, until the major part of it has been utilized. Only the cutting edge is ground, and no steel is removed in the process. The recess in the hardened steel shank is finished plane and true with a Kennametal-tipped fly cutter, or a Kennametal end file. The clamp and set screw are positioned to avoid abrading and permit smooth, unimpeded chip flow.

Use of Kennametal H.D. tools permits minimum tool stocks, since one shank serves for the life of many tips, and the proper grade of Kennametal tip can be used for each job. Heavy-duty Kennametal tips are available in Grades KM and K3H for general steel-cutting, Grade K2S for machining steel castings where scale is encountered, and Grade K6 for cast irons. H.D. tools are made in several styles, in the larger sizes, ie, with shanks 1" wide, or more.

PAPER AND GASKET CUTTER

By H. F. WILLIAMS

Recently we were faced with the problem of cutting out some various sized disks of white-faced cardboard, 1/8" thick for test purposes. A bandsaw and sander did not produce a satisfactory job as the periphery was to be smooth and well

LADY WRESTLERS

**AREN'T NEEDED IF YOUR
MAGNETIC CHUCKS HAVE
NEU-T-ROL CONTROLS —**



Many grinder jobs have been handled by men because the work has been considered too heavy for women. Frequently it has been necessary to "wrestle" work pieces away from magnetic chucks with crowbars, hammers and brute force. Equip these same magnetic chucks with Neu-T-Rol and women can take over the work, helping to relieve the manpower shortage.

Neu-T-Rol is the modern, efficient and easy method of releasing the workpiece from the chuck — and it demagnetizes as it releases. Neu-T-Rol does away with all need of hammering and prying. It saves time and tempers, as well as scuffed knuckles. It eliminates warped, distorted workpieces and marred chuck faces. It protects chucks against harmful voltage surges.

Neu-T-Rol is fully automatic in operation. Neu-T-Rol is scientifically time-controlled. No human factor, such as delicate timing, enters into the successful performance.

Neu-T-Rol is easily installed on grinding machines now in operation in your plant — or on new grinding machines before delivery to you.



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Just as important in chuck operation is an unfailing source of d-c power. Electro-matic rectifiers are absolutely dependable, heavy duty, industrial rectifiers. Engineered to stay on the job day after day, electro-matic rectifiers are available in 42 models — in capacities ranging from 125 to 3000 watts.

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NEW METRO-VISE POSITIONER

(TWO TOOLS IN ONE)

FACE PLATE

QUICKLY TILTED TO ANY ANGLE



**BABBITT
JAWS**
SMOOTH
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BALL AND
SOCKET
PRINCIPLE

CLAMPING LEVER

RELEASES, OR LOCKS PLATE IN POSITION

for MOUNTING YOUR VISE, FIXTURE or used as ANGLE PLATE

Holds or mounts work rigidly,
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Quick, accurate adjustment to any
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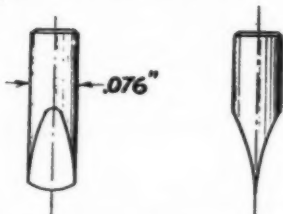
Easy to use. Three standard sizes.

Send for literature and prices.

METRO-VISE CO.

235 STEPHENSON BLDG.
DETROIT 2, MICHIGAN

defined. A punch press was tried on the smaller diameters but a ragged edge resulted, especially to the thin white paper facing on the board. A hand shear was out of the question. A sample was cut out with a razor blade but this was too long and tedious a job, especially when the largest disk to be cut out was 10" in diameter.



The most successful approach to the problem was to remove the pencil lead from a beam compass and insert a small cutting tool as shown in the sketch. A 3/32" piece of drill rod was ground down to .076" diameter to fit the compass pencil lead chuck. The sides were hollow-ground and rounded at the cutting edge, the latter as shown in the view at the left. This rounded edge made cutting easier.

By carefully scribing the circle on the cardboard with just enough pressure to cut through the white facing, the rest was simply a matter of making several complete revolutions with the beam to cut through the 1/8" thickness.

Experiments were also made with this blade set up as a trepanning tool in a drill press. It was found that only small disks could be cut out efficiently because the equipment became too heavy for enough stiffness to cut out the larger disks. Also it was too messy a job because the white facing of the cardboard became soiled from oil and dirt. Cutting out by hand as described was the best way.

This cutter was also found to be very successful in cutting out gaskets up to 1/8" thick from gasket sheet material. Cushioning rings cut from blotter paper such as used under the flanges of grinding wheel spindles were also cut out as described. The cutter was used in an unheat treated condition and was found to stand up satisfactorily for a long time.

GRINDING SMALL RODS

A spring steady rest, devised by H. Rennie of the Punching, Tool and Die Division at General Electric's Schenectady

INDUSTRY'S FIRST CEMENTED CARBIDE ROTARY FILES

LARGE

or

SMALL

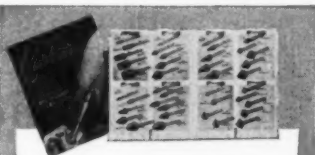
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Do YOU have a particular burring or filing operation that requires an unusually large or small size Carbur . . . or one of a specially designed shape? Lincoln Park can supply it promptly for, in addition to producing twelve standard shapes—each in from four to six sizes and from fine to coarse cut—Carburs' facilities are set up to turn out Carburs in almost any shape or size to your special order.

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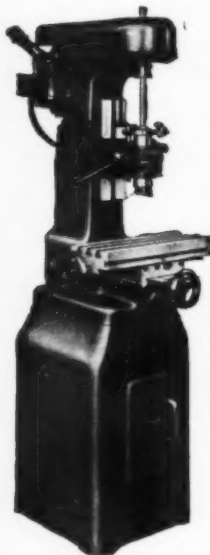


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Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

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NEVER HAVE WE SOLD SO MANY OF THESE LITTLE MACHINES



The Linley is performing its way into many new locations ... and making good on our promises of its speed, stamina and money making characteristics. For the countless small toolroom jobs such as die making, metal patterns, models, jigs, fixtures, etc., it is saving larger machines for their rated capacities and cutting costs by saving valuable toolmakers' time.

There are 8 spindle speeds to 4250 r.p.m.; velvet feed with micrometer

screw head; anti-backlash counterbalanced quill; grease-sealed bearings; 7"x17½" table; 18½"x20" floor space.

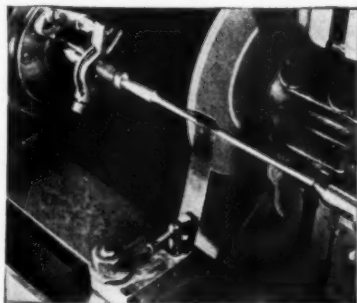
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Works, has been successfully used to eliminate vibration while grinding small diameter rods to extremely close tolerances. This useful, easily constructed device has greatly reduced spoilage of these precision parts.

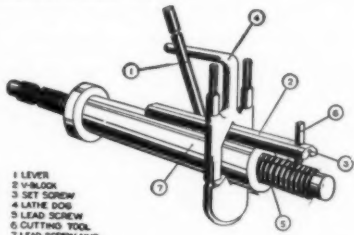


The upright spring, attached to end of the base by means of a bridge clamp, rests against center of the rod under pressure, thereby giving support to the work. The bridge clamp is used to avoid weakening of the spring with screw holes, which would otherwise be necessary.

The screw used to adjust pressure of the spring has a spherical end composed of a steel disk and a leather pad. The leather pad gives a cushioning effect between the two metal parts and tends to absorb vibration transmitted thru the spring.

REPAIRING LEAD SCREWS

A quick and easy method of reconditioning damaged threads on lead screws, deformed either thru accident or in normal wear, has been devised by Clifton Roberson, a maintenance man at General Electric's Erie Works.

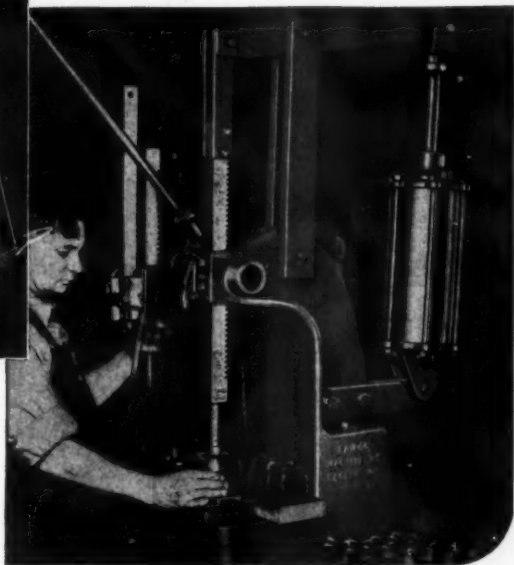


In this method a lathe dog (4) clamps a V-block (2) machined to hold a cutting



Small arbor press to crimp wire, powered by a small Model A NOPAK Cylinder mounted on hinged base.

Hand and air power both are used in this dual press equipped with 10" NOPAK Model E Cylinder.



Air Cylinders **STEP-UP** BRUSH PRODUCTION

With new machinery and experienced help hard-to-get . . . the wartime demand for circular wire brushes created a real problem for The Milwaukee Brush Mfg. Co. Modernization of existing equipment was the happy solution . . . increased production ten-fold with only twice as many workers.

A vital step in this modernization was the application of air cylinder power to various types and sizes of arbor presses which perform many of the holding, clamping and squeezing operations in assembling these brushes. Altogether, nearly twenty machines were converted to air operation. Foot control valves leave the operators' hands free to manipulate tools, dies and parts for speedy assembly.

Perhaps some of your machines can be modernized through the application of air or hydraulic power. NOPAK Cylinder Bulletin 82 can help you decide. Write for it.

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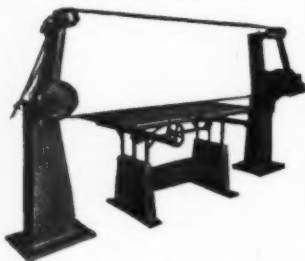
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JEFFERSON SWING FRAME GRINDER and POLISHING MACHINE

Takes grinding wheels up to 14"x23/4". For grinding and snagging castings or for polishing, buffing large sheets, tubing, bars and unwieldy shapes. Can be swung forward, backward, up, down, right and left, and at any degree of angle.

**WRITE FOR ILLUSTRATED
LITERATURE**



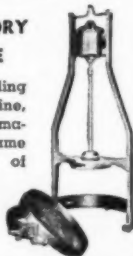
Above Illustrated

JEFFERSON ENDLESS BELT SANDER

For wood or metal finishing. An economical machine which eliminates costly hand sanding and finishing. For either large, small, flat, concave or convex surfaces.

JEFFERSON GYRATORY FOUNDRY RIDDLE

... for screening, moulding and core sands. For fine, medium and coarse dry materials. Note hinged frame which permits change of sieve. Has capacity of 10 men riddling by hand. Over-all height 60".



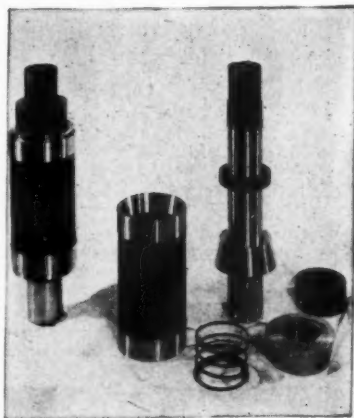
**JEFFERSON
MACHINE TOOL CO.**
700 W. 4TH ST. CINCINNATI 3, OHIO

tool (6) to the lead screw nut (7). In effect the nut becomes a die with a single point cutting tool when a tool bit, ground to fit the thread, is inserted in the V-block and locked with a setscrew. The tool will clean burrs and bumps preceding the nut, which is held stationary by a long lever (1), while the screw (5) is driven by a lathe.

The method of repair, illustrated, can sometimes be performed without disassembling the screws.

EXPANDING ARBORS

Tool steel tubing, a material used to eliminate the boring operation in the manufacture of tubular or ring-shaped tool steel parts, has proved successful in making expanding arbors. The illustration shows such an arbor, assembled at the left of the picture, and "exploded" at the right. The principal part, made of tool steel tubing (the part most expensive and time-consuming to bore) is the slotted sleeve shown in the center. Other tool steel tubing parts are three rings, one straight and two tapered, shown on the shaft and beside it.



The arbor sleeve is 13 1/8" long, 6 7/8" OD, and 4" ID, with six slots, three at either end, milled from 1/4" holes bored in the wall. In milling, a narrow tie bar was left at the edge of the sleeve until after heat treating, to prevent distortion, and was then cut thru with an abrasive wheel. This part is capable of .050" expansion, which is achieved by drawing up on the nut and forcing the tapered parts toward



Photo above shows Jefferson Turrets on 16" lathe

Convert

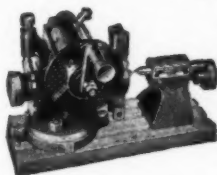
**YOUR ENGINE
LATHE INTO A
TURRET LATHE
IN 15 SECONDS**

Yes, it's as easy as that! You simply attach the Jefferson Tail-Stock Turret, the Jefferson Tool-Post Turret, and the Jefferson Adjustable Pull Feed to your lathes as shown in illustration.

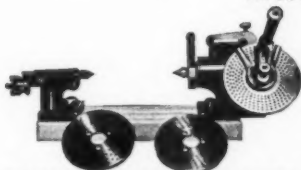
The productive capacity of these machines will be more than doubled in many instances because there will be available at all times **NINE DIFFERENT TOOLS.**

With these three JEFFERSON time-saving devices attached to a lathe, any kind of work may be done, such as forming, roughing, boring, finishing, knurling, drilling, tapping, etc., without stopping the lathe, or changing tools. THE JEFFERSON TURRETS are made very substantial, rigid, accurate and in several sizes to fit small bench lathes up to 24" swing.

Jefferson Turrets are real production tools—substantial, rigid, accurate and adaptable to any size or make of engine lathes. They must not be confused with the small makeshift gadgets now on the market.

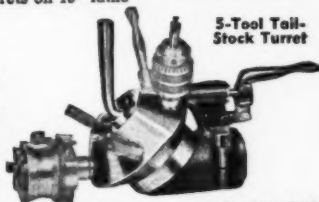


**7 1/2" Swivel Base Dividing Head — In Stock
IMMEDIATE DELIVERY
No Priority Required**



**PLAIN DIVIDING HEAD — complete with 3 Dividing Plates, 1—24 notch rapid Indexing Plate and Tailstock, Delivery 2 weeks.
7 1/2" Swivel Base Dividing Head and 6" Tilting Dividing Heads. Immediate Delivery.**

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5-Tool Tail-Stock Turret

PAT. PENDING



4-Tool Tool-Post Turret

TURRET DELIVERIES IN 6 DAYS

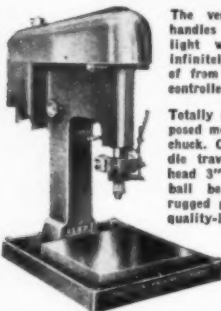
JEFFERSON MACHINE TOOL CO.

700 W. Fourth St.,

Cincinnati 3, Ohio

Tool-Post Turrets, Tail-Stock Turrets, Adjustable Pull Feeds, Belt Sanders, Gyrotory Foundry Riddicks, Overhead Swing Frame Grinders, Milling Machines, Dividing Heads and Vises.

Type 25 REED BENCH DRILL



The versatile sensitive drill handles an unusual variety of light work. It provides an infinitely variable speed range of from 1500 to 10,000 rpm, controlled by handwheel.

Totally enclosed, the only exposed moving part is the drill chuck. Capacity is $\frac{1}{4}$ " spindle travel 3", adjustment of head 3". Equipped with full ball bearing spindle, these rugged precision machines are quality-built.

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bulletin
giving
full details.

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GREENFIELD, MASS.**

SAFETY "WEDGE GRIP" STEEL HAND STAMPS



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Ideal for mass production markings of defense products . . . trade marks and symbols. Any size or number of characters available.

Help prevent an accident today!
Write for Literature



the center of the arbor. The latter parts are made simply by grinding a 13° taper on rings of tubing to correspond with the internal taper of the sleeve.

This tool was previously made of a solid bar of carbon steel, bored out, machined and carburized, but this method was expensive and the material unsatisfactory. It warped in hardening and sprang out of shape in use. The tool steel parts wear much better. For more information, write Bissett Steel Co., 945 East 67th St., Cleveland 8, Ohio.

HANDY REMINDER BOARDS

By FRANK V. FAULHABER

The question of re-ordering equipment, parts and supplies is often forgotten until too late. Sometimes an employee means to tell a superior or jot the memo down on a piece of paper. This superior at the moment may be in another department, or the slip of paper, even when it is placed on a desk, may go astray. Sometimes an employee decides to wait until the man in authority approaches, which may result in late delivery of replenishments.

One large machine works has definitely overcome this problem by placing, conspicuously and conveniently, special reminder boards, together with chalk and erasers, at different points in each department. These reminder boards are three feet square, and one of them is easy of access, without search, no matter in what part of a department an employee may be in. The boards are veritable reminders for prompt notification of necessary parts or materials, and eliminate any excuse for oversight; memoranda for purchase or replenishment of equipment and supplies is never lost—requirements are filled promptly, on time.

The assistant foreman in each department reviews the plant's reminder boards regularly as he does about his rounds, and indicated orders are duly dispatched. Pertinent information regarding quantity, quality, kind, size, grade, and kindred necessary data can be recorded on the boards, as well as plant matters pertaining to accident prevention, repairs, maintenance, and the like.

FORD CARBIDE CUTTERS

A well illustrated 4-page folder on carbide rotary cutters is now available from M. A. Ford Mfg. Co., Inc., 746 W. First St., Davenport, Iowa. It shows additions to their line, and the company points out that improved methods of production now make it possible to turn out custom made cutters to the most exact specifications.



(Above) Checking runout on gear. Work is mounted between centers and rotated with one hand. Indicator clamp stand is controlled by operator's free hand as shown.

USING one hand to control all moving elements on the Sundstrand Bench Center, the operator's other hand is free to control the part being checked. The indicator support is easily controlled with one hand. It is moved away from the work when loading and unloading, and against the work for checking runout.

For rapid loading and unloading, the spring loaded center can be quickly clamped and unclamped by using headstock center clamp. After unclamping, the center is retracted by slight hand pressure on the center retractor lever.

Either headstock or tailstock can be unclamped, positioned and reclamped

HOW

"One-Hand Control"

Speeds Precision Checking

Runout Checked to Within .0001" Limits on Sundstrand Bench Centers



(Above) Sundstrand Bench Center showing standard parts.

by one hand using the headstock or tailstock top lever clamps.

These easy and simple operating features speed checking for runout. Shoulders, faces or variations from true circular form on work such as gears, sprockets, shafts, pinions, or practically any parts which can be rotated between centers, may be checked on this Bench Center. Here is a practical addition to your tool room, production or inspection department.

Range of Sizes:

6" x 18"	12" x 36"	12" x 60"
6" x 36"	12" x 48"	12" x 72"

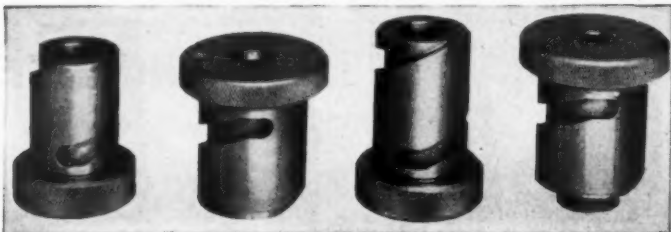


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Rigid Mills • Field-Service Rigid Mills • Automatic Lathes • Hydraulic Equipment • Drilling and Centering Machines • Special Milling and Turning Machines

2535 ELEVENTH ST., ROCKFORD, ILLINOIS, U. S. A.

SPIRAL GROOVED SELF LOCKING BUSHINGS



Spiral-grooved, self-locking bushings, devised by the Planning and Wage Payment Department at General Electric's Erie Works, are adaptable to any fixture with members sufficiently large enough to accommodate liner and slip bushings. The bushings provide a positive locking feature which insures an efficient and accurate means of drilling, reaming, and broaching brush-holder locating holes in motor magnet frames to extremely close tolerances.

The bushings are of various sizes. They

are hardened, and precision ground with a spiral groove incorporating a flat at the top which interlocks with a hardened pin inserted in the liner jig. Clockwise rotation of the drill, which holds the bushing in position, prevents it from being forced out of the jig during the drilling operation. The drill is well piloted and will not deflect or run, thus eliminating possibility of drilled hole mislocation.

The conventional slip type bushing was ejected from the liner bushing by chips, allowing cutting tool to deflect. This re-



SAVE Labor and Time

Eliminate heavy lifting. Cut handling costs. Table

swivels and locks in any position. Can be varied $15\frac{1}{2}^{\circ}$ by slight foot pressure, leaving operator's hands free. Engineered and built by tool engineers, experienced in production of special machines, dies, jigs and fixtures for exacting requirements.

Send **TODAY** for illustrated catalog No. 2.

MIDWEST TOOL & ENG. CO.
112 Webster St., Dayton, Ohio

YOST DRILL PRESS VISE



This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, inches	Opens inches	Weight Pounds
1D	$3\frac{1}{2}$	$3\frac{1}{4}$	$12\frac{1}{2}$
2D	5	$5\frac{1}{2}$	23

Do you need a vise of ANY type?

Write today for bulletins on the extensive Yost line

YOST MFG. COMPANY
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MEADVILLE, PENNSYLVANIA

SHAPING • Milling • Drilling • Boring
NOW AVAILABLE ON *Bridgeport*

**TURRET MILLING
MACHINE**



A new shaping attachment adds greatly to the utility of Bridgeport machines. The design is such that this new attachment (shown on back end of overarm) can be mounted on existing Bridgeport turret Milling Machines and also on other types of milling machines and special production equipment.

Shaping operations can be performed at all angles, making this attachment fast and practical on die and mold work of all kinds, as well as for intricate slotting on production jobs.

The Bridgeport Turret Milling Machine with High Speed Attachment handles milling, drilling and boring at all angles, with maximum ease and convenience. It is accurate and speedy, sturdy and powerful—a precision machine for production demands.

Features include: — 15" diameter turret with 5" overarm, rugged construction, table, knee and saddle in convenient front-of-machine position, anti-friction bearings throughout, keyed overarm with worm wheel control for angular settings, large diameter graduated dials.

Write for illustrated bulletins giving full information.

Write for
Illustrated
Bulletins
giving details

THE BRIDGEPORT MACHINES, INC., Bridgeport, Conn.

sulted in holes being drilled, reamed, and broached out of location.

CARBIDE MANDRELS

Of special interest to tube mill men is the new 20-page booklet entitled "Tips for Tube Mills on the Use of Carbonyl Mandrels" which has just been issued by Carbonyl Co., 11139 E. 8-Mile Rd., Detroit 32, Mich.

According to this booklet, carbide mandrels used on modern tube draw-benches should be given the same care as any other precision tool used in mass production. With these precautions, it is stated,

use of carbide mandrels will insure better inside finish, closer tolerances on long runs, more continuous operation, and fewer rejections.

Careful cleaning and pickling, the book states, is essential to avoid scratches on tubing. A light etch on the tubing holds the lubricant better and provides a good uniform drawing surface. It is important that all tubes remain lubricated thruout the drawing operation. The mandrel will pick up and scratch the tubing if tubes are improperly lubricated. All tubes should be annealed after each pass to obtain greater economies and longer mandrel life. All mandrels should be serviced at regular, predetermined intervals rather than when they "appear" to need servicing.

The booklet is illustrated with numerous blue-print type sketches.

SAVING TIME

By FRANK V. FAULHABER

"They tell me we received the milling saw we sent for on approval," complained the machine shop foreman, as he turned his gaze here and there. "I've been looking for it all morning, but I can't find it, nor can anyone else. I don't know! We were going to try it out, for it's put out by a new firm, but it seems the thing's off now. We'll have to pay for it, and we won't know whether it'll do for our purposes or not!"

This foreman's experience is not singular by any means. It is typical of what happens every day in some shops. It betokens a system of carelessness that is not calculated to work to the best interests of the plants. Obviously, where no adequate care is taken for single items, however small, it isn't reasonable to expect all operations to run smoothly, without costly interruptions that consume valuable time, patience, and money.

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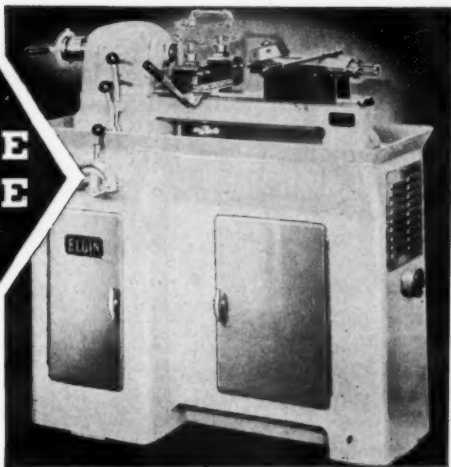
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VARIABLE SPEED DRIVE

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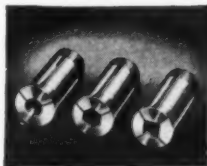
Let's say your operator is doing a fine drilling and tapping job on a hand screw machine. He needs a high spindle speed for drilling, a low speed for tapping. On an ordinary machine it may take him longer to stop the machine, shift the belt and start again, than to do the tapping operation itself. Being human (and perhaps pressed for time), he may not bother changing speed. Result: A job not up to specifications.

The VARIABLE SPEED DRIVE on these three Elgin Precision Ma-

chines encourages the operator to use the proper speed for every operation, changing as often as necessary. By an easy shift of the control lever (arrow, above) he obtains instantly any speed within a wide range of RPM. By the time he has indexed the turret, the proper speed is ready — no stopping machine, no shifting belt! Investigate these three outstanding machines for your small parts production where precision counts: Elgin Precision Hand Screw Machine, Elgin Horizontal Bench Milling Machine, Elgin Bench Lathe.

ELGIN

Precision Hand Screw Machines,
Horizontal Bench Milling Machines
and Bench Lathes — all three feature
the VARIABLE SPEED DRIVE.



Illustrated — (1) Hand Screw Machine (variable speeds, 120 - 3800 RPM). (2) Horizontal Miller (variable speeds, 85-2750 RPM). (3) Bench Lathe (Variable speeds, 120-3800 RPM). — (4) Elgin Collets, all types, all sizes.

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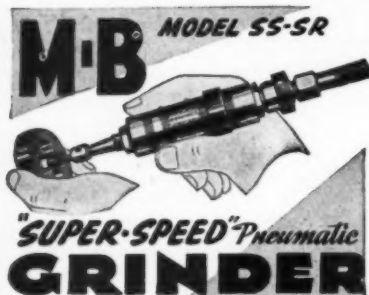
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M-B PRODUCTS
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In better regulated shops, executives see that proper care is taken of all submitted samples of products. All new pieces sent on approval naturally are included. And this applies to all articles with which the plant wishes to experiment.

It matters not how small the machine shop is, generally there is room for improvement. I recently visited a small plant that had everything strewn about in the offices. Gears, screws, files, saws, gages, gaskets, and innumerable other articles could be seen on a long bench about which the superintendent worked at times. And mixed with all this, were samples or pieces obtained for experiment, along with plans, papers, memoranda, etc.

Yet the superintendent seemingly was contented. He picked up a few catalogs and carried them to the other end of the room where they were placed with a lot of others, upon a large pile, including magazines, telephone books, more catalogs, considerable odds and ends, old newspapers, plans, old letters, bills, etc. Everything haphazard! And the condition signified waste and carelessness.

Many times a machine shop foreman will receive some drills for a tryout. Often he is too busy at the moment to give the matter due attention. He accepts the drills for future consideration, then lays them aside in some out-of-the-way place. Later he may be fortunate enough to find these drills but, again, he may not. If those drills go astray, the machine shop is deprived of the experimentation, at least for the time being. If the drills are of a better quality than the executives are non the wiser. And to institute a needle-in-the-haystack hunt often is a waste of time.

An expert toolmaker, who has worked in all kinds of plants, recently observed:—"There is nothing that disconcerts me more than to be interrupted in my work because some tool or some article cannot be found. I have had many arguments with superintendents just because of this. They have little regard for such things, which to their minds are trivial matters. But when you consider all such let-ups, losses of time, and interruptions that react against a shop in the course of a year, the matter looms large.

Of course, individual employees in larger plants are not invested with the responsibility of looking after all these small matters. Usually the foreman receives articles that are used in his department. In many plants tho, the foremen are so busy that such matters do not receive proper attention. Elsewhere, the foremen

EVER GO PROSPECTING FOR

Diamonds?



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are so crowded for space that they cannot find enough room to store new and sample articles. As a result, many supplies, especially small items, are lost, or buried. In some plants it is the practice to throw new supplies in with a lot of other stuff under a bench. Then, when the foreman wishes to find the taps that were delivered to him a short time previously, there follows the usual time-consuming and often-fruitless search.

Many of the larger plants have efficient receiving departments. In smaller plants, tho, isn't it high time to provide a place to receive submitted samples and new products recently purchased?

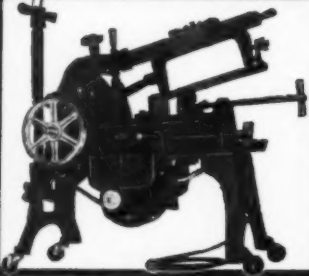
In some offices, it is the policy to let catalogs accumulate, usually with no good end in view. Many an executive has deprived himself of the benefits of certain information available in a catalog, received, yet somehow misplaced.

In a receiving room, such as suggested, the catalogs regularly received can be filed for quick reference. That will save time and patience. Information regarding samples and new supplies can also be recorded for subsequent use.

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The life of Westinghouse high speed tool motors has been greatly extended without making any basic changes, by re-examination of every tiny detail of their design and construction.

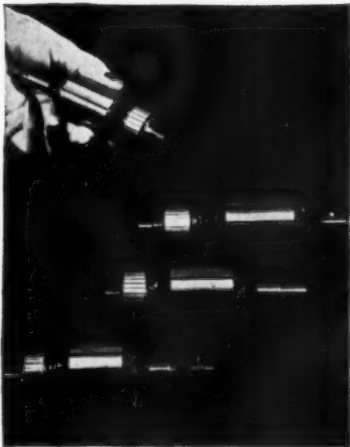
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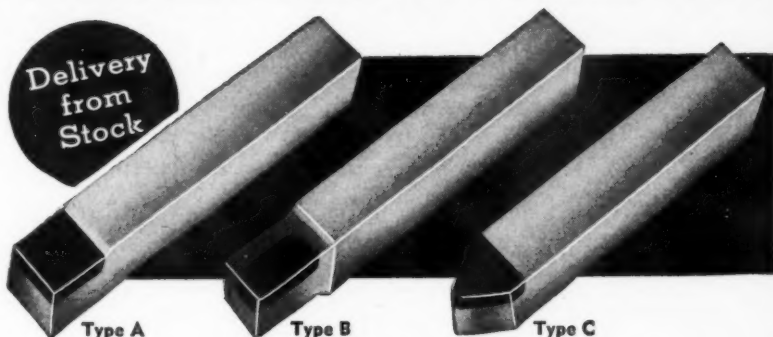
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Furnished in 2 Grades of Carbide — Specify Which Wanted:
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	A- 15		1/2 x 1/2 x 3-1/2.....	1.10
	A- 17		5/8 x 5/8 x 4.....	1.65
	A- 18		3/4 x 3/4 x 4-1/2.....	2.25
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	BR- 42	BL- 72	5/16 x 5/16 x 2-1/4.....	.70
	BR- 43	BL- 73	3/8 x 3/8 x 2-1/2.....	.75
	BR- 44	BL- 74	7/16 x 7/16 x 3.....	1.10
	BR- 45	BL- 75	1/2 x 1/2 x 3-1/2.....	1.10
	BR- 47	BL- 77	5/8 x 5/8 x 4.....	1.50
	BR- 48	BL- 78	3/4 x 3/4 x 4-1/2.....	1.60
	BR-406	BL-706	1 x 1 x 7.....	3.25
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	C-123		3/8 x 3/8 x 2-1/2.....	.95
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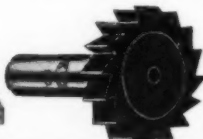
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and run at 8000 or 10,000 rpm fully loaded. When load is removed, the speed jumps to 20,000 rpm, which imposes severe centrifugal stresses on rotating parts. In such service, motors may last only a few hours or a few hundred hours depending on severity of service.

Like building automobiles for racing, the problem of the high-speed tool-motor designer is to make a seemingly small improvement here, a slight modification there, which in the aggregate lead to overall improvement in the strenuous service intended. For example, a thermo-setting high-temperature varnish with a durable, moisture-resistant surface has been developed that is extremely resistant to vibration. Altho the armature is machine wound, each turn of each coil is shaped as it is wound instead of shaping the coil as a group. Assembled commutators are first spun at high speed to disclose any mechanical defects before they are placed on the armature.

Just as many of the lessons learned in racing driving were embodied in stock cars, so many developments that grew out of attempting to improve high-speed motors have already been applied to the common garden variety of universal motors used in blowers, vacuum cleaners, and many prosaic jobs.

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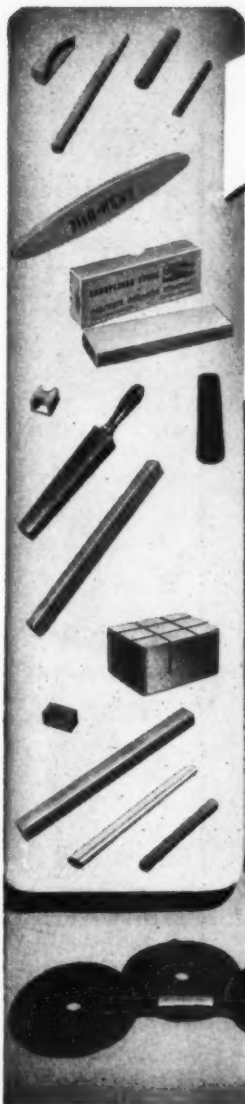
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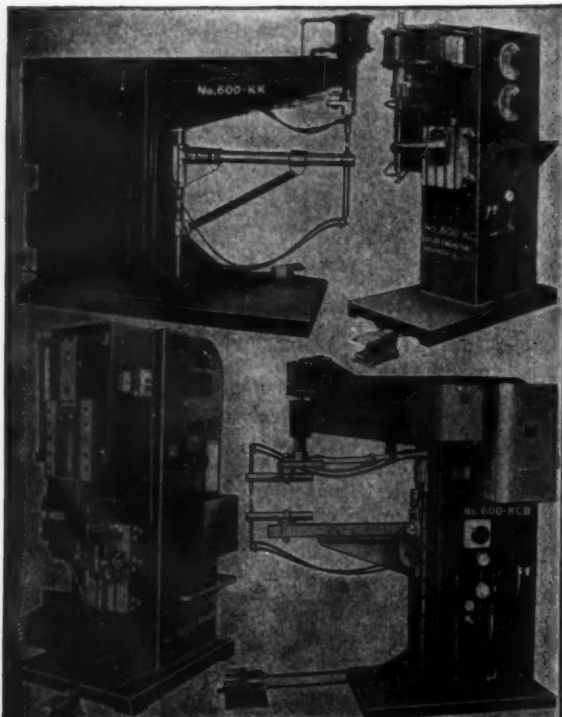
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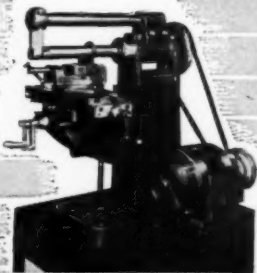
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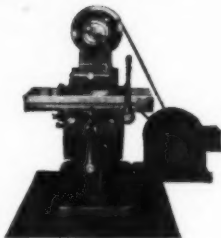
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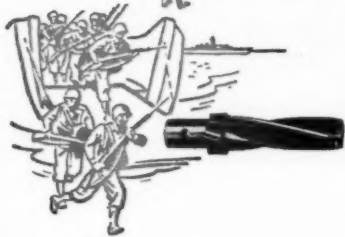
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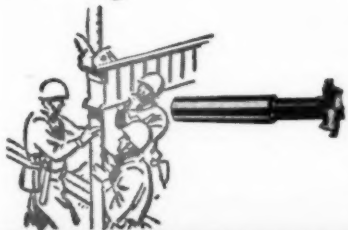
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It's true! Down go prices on SUPER Shell End and Face Mills! Ever increasing orders from users, improved manufacturing techniques, increased production facilities, engineering research and development . . . these are reasons why the new low prices shown below are possible—why now, more than ever, SUPER Milling Cutters are real MONEY SAVERS!

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SIZE	FOR GENERAL USE		FOR STEEL		NEW PRICE EACH
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1 1/4"	4	GSM-1	6	SSM-1	\$17.00
1 1/2"	4	GSM-2	6	SSM-2	18.00
1 3/4"	4	GSM-3	6	SSM-3	19.00
2"	4	GSM-4	6	SSM-4	19.50
2 1/4"	6	GSM-5	6	SSM-5	20.00
2 1/2"	6	GSM-6	6	SSM-6	20.50
2 3/4"	6	GSM-7	6	SSM-7	21.50
3"	6	GSM-8	6	SSM-8	22.50
3 1/4"	6	GSM-9	6	SSM-9	25.00
4"	6	GSM-10	6	SSM-10	27.50
4 1/4"	6	GSM-11	6	SSM-11	32.00
5"	6	GSM-12	8	SSM-12	35.00
5 1/4"	6	GSM-13	8	SSM-13	37.00
6"	6	GSM-14	8	SSM-14	40.00
FACE MILLS					
8"	8	GFAC-8	10	SFAC-8	60.00
10"	8	GFAC-10	12	SFAC-10	75.00

SUPER TOOL COMPANY

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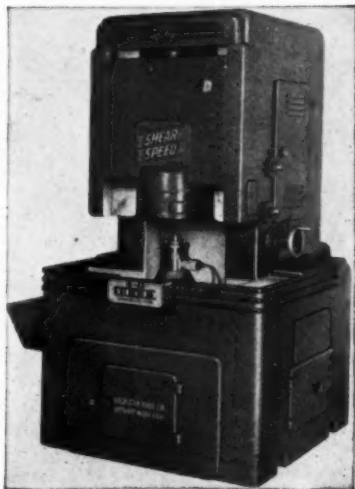
WHAT'S NEW IN METALWORKING

MICHIGAN TOOL ANNOUNCES SHEAR-SPEED GEAR CUTTER

A NEW method of gear-cutting is announced by Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich. It is based on a unique machine which cuts all gear teeth simultaneously with radially fed form-tool blades having a shear-cutting action.

Under development for several years, the new "Shear-Speed" is capable of rough and semi-finish cutting as many as 60 to 100 or more gears per hour, depending on the job. Cutting time on the gear shown in Fig. 2, for instance, is well under one minute.

The Company's objective in development of the "Shear-Speed" was to bring the speed of gear cutting up to the level set by modern gear-finishing machines. Up to the present time, one gear-shaving machine has been capable of handling the output of a considerable number of shapers and hobbers. With the new "Shear-Speed", production times for rough cutting and finishing can be equalized and predetermined:—One "Shear-Speed" and one shaving machine each, can be count-



WHEN "SPECS" CALL FOR Holes from .004 to 5/16" dia.

Intricate, precision-accurate drilling in quickest possible time and most dependable positioning.

For aircraft, Diesel, laboratory and other intricate drilling.

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The HAMILTON
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Super Sensitive
DRILLING MACHINE



SHELDON

PRECISION LATHES



Among moderate priced lathes, the SHELDON 1026 BMWQ is not only superior in design, workmanship, features and precision, but in its convenient, space-saving and more efficient overhead motor drive

Write for Catalog



SHELDON MACHINE CO., INC., 4242 N. KNOX AVE., CHICAGO 41, U.S.A.

ed on to produce continuously a definite quantity of gears per hour or day.

In addition to its higher output rate, the new machine uses for the first time, balanced cutting pressure around the gear. Only a simple grinding operation is required to bring dull blades back to correct form.

The machine is exceptionally easy to operate and no particular skill is required. Gears are merely placed on work holder. Chucking is part of the automatic machine cycle. Operator merely presses a button to start machine. When cycle is completed, machine returns to loading position automatically and releases finished gear for removal and loading of another blank. The design eliminates chance of loose arbors. There are no nuts to tighten.

In action, when gear is automatically clamped, head of machine, containing cutter head (Fig. 2) automatically lowers into cutting position, automatically locking. Work then reciprocates vertically. At beginning of each up-stroke, all blades are advanced radially (fed into work) an equal amount. On return stroke, blades

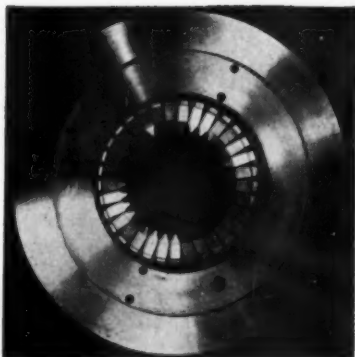


Fig. 2—Interior of cutter head, showing assembly of individual simple form tool blades—each responsible for removing the metal between two adjoining teeth in a gear. The cutter head shown is for a 50-tooth 4" diameter gear.

—●—



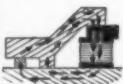
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The arrows indicate the path of the magnetic flux in the new

POWERGRIP MAGNETIC CHUCKS



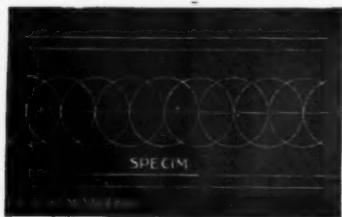
Uneven or odd shaped pieces are held as shown with plain steel blocks (the black blocks are solid).



These chucks have often returned their cost, by holding work without expensive jigs or fixtures, on one job.

Furnished complete, ready to plug into 110 Volt A.C. light circuit, with reversing control. Nothing more to buy. Complete unit easily portable. **GUARANTEED.** Write for information or send print for details.

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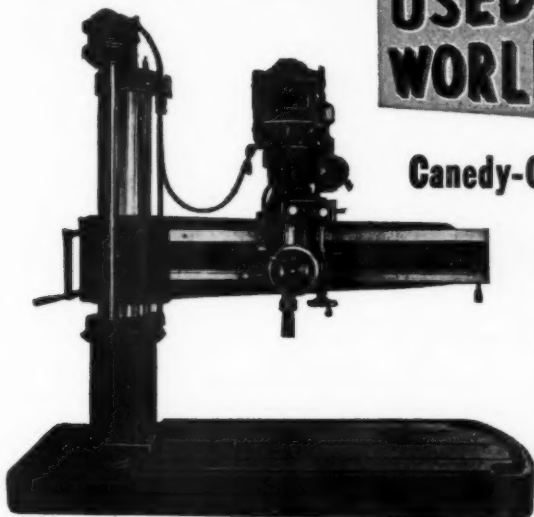
Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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SPECIFICATIONS:

Drills to the center of circle on base or table

Length of arm

Greatest distance from spindle to base

Minimum distance from spindle to base

Minimum distance from spindle to column

Traverse of spindle

Hole in spindle—Morse Taper

Diameter of spindle at nose

Traverse of head on arm

Traverse of arm on column

Spindle speeds with 1200 RPM motor

Spindle speeds with 1800 RPM motor

Feeds per revolution of spindle

Bearing of arm on column

Size of main driving motor

Height of drill column over gears

Working Surface of Base

Net weight

9" Column

3' Arm

73 1/2"

3"

43 1/2"

9 1/2"

10 1/2"

9 1/2"

No. 4

2 1/2"

25 1/2"

21 1/2"

(60, 85, 130, 180,

(425, 560, 880,

(1200 RPM

(85, 130, 180, 274,

(560, 880, 1180,

(1750 RPM

(.004" .007"

(.010" .020"

14"

2 HP.

89"

29"x45"

4000 lbs.

11" Column

4' Arm

98"

4"

48"

15"

10"

9 1/2"

No. 4

2 1/2"

38 1/2"

24"

on all models

(85, 130, 180, 274,

(560, 880, 1180,

(1750 RPM

(.004" .007"

(.010" .020"

16"

2 HP.

98"

30"x50"

6200 lbs.

11" Column

5' Arm

120"

5"

48"

17"

10"

9 1/2"

No. 4

2 1/2"

48 1/2"

22"

on all models

(85, 130, 180, 274,

(560, 880, 1180,

(1750 RPM

(.004" .007"

(.010" .020"

18"

2 HP.

98"

30"x50"

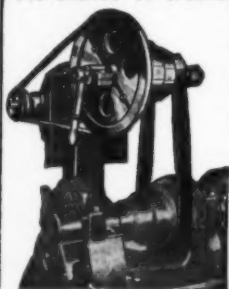
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Newark, (5) New Jersey

are retracted slightly as on conventional gear-shapers to provide clearance for the tools. The amount blades are fed into work on each stroke is adjustable. Correct sizing of work is also automatically controlled and adjustable.

A "jog" control is provided on machine to inch it for set-up adjustments when shifting machine to a different job, etc.

Adjustments are also provided for speed of vertical reciprocation and length of stroke. To sharpen blades, or to change over to another type of gear to be cut, the entire inner cutter-head assembly is removed, as a unit, permitting insertion of another cutter head and resumption of productivity.

First of the new "Shear-Speed" sizes to be made available is the 1843—capable of handling gears up to 4" diameter and 2" face width—since this covers the range of most widely needed gears at present.

Shoulder gears can be handled easily on the machine, since its action in this respect is similar to that of a shaper cutter. Helical gears as well as spur gears can be cut.

The machine incidentally represents the simplest method yet evolved—regardless of speed—of rough and semi-finish cutting of involute splines.

Among design features of the machine are its extreme safety of operation, and exceptional rigidity. Fig. 1 gives an idea of the unusual amount of "beef" provided.

In addition, deflections are minimized by virtue of the fact that cutting loads are completely balanced.

Special provision has been made for rapid chip clearance from the work in view of the high rate of metal removal possible. Cutting fluid supply is located in base of machine and is used under relatively high pressure to wash out chips.

PROFILOMETER BOOKLET

The technical aspects of the Profilometer as an electronic measuring instrument are discussed in a new "Technical Supplement".

Altho devoted mainly to the development and technical side of the Profilometer, a section of the book describes the entire line of equipment. Illustrations are widely used thruout.

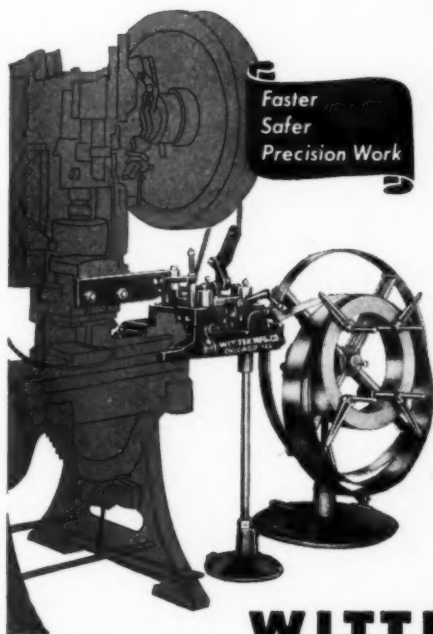
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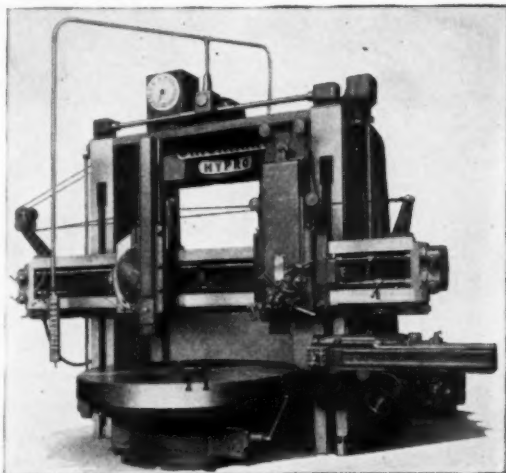
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Progress in the vertical boring mill field has been accelerated recently thru development by Cincinnati Planer Co., 3120 Forrer St., Cincinnati 9, Ohio, of the Cincinnati Hypro Table Drive. This is considered one of the most significant advances made by Cincinnati Planer Co., since it entered the vertical boring mill field in 1910.

The new machine was designed to meet the needs of industry for high production in boring and turning operations. Conventional gear shift changing of speeds has been replaced by fingertip speed adjustment. As a result, the complete range of table speeds under cutting loads ordinarily encountered may be handled by push button

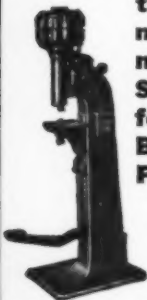


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Output increased 150% per tool grind. With Sunicut they increased tool life

from a previous average of 8 pieces per tool grind to 20 pieces. Results... longer tool life... improved quality of finish... less time lost for tool resetting.

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control from operator's normal working position. He can do this without changing gears or stopping table.

The multi-point, fine increment motor rheostat used in conjunction with this drive insures maximum production by making available, table speeds exactly suited to the job being performed, instead of compromise speeds which are inevitable with conventional manually operated gear shifting.

Continuous adjustment of table speeds necessary for maximum production on work of varying diameter, is made possible without stopping table or interrupting cut. This provides "tailored" table speeds.

Heavy cutting requirements at low speeds are met by a suitable back gear operated by a single lever.

Set-up time is reduced by fine "inching" control in both directions of table operation.

Complete control of all motors from a single, accessible pendant station plus absence of table clutch and brake shifting, lessen operator fatigue.

On mills having coolant or chip guards, need for removing guards or bending over them to shift gears is removed. This provides better working conditions for operator.

Visibility of the large speed dial mounted on top of boring mill eliminates extra movement about of operator and gives him instant indication of table speeds. Pre-set table speeds may be determined at a glance.

TAPPING AND THREADING

A new Tapping and Threading Machine was recently built by the Cleveland Tapping Machine Co., 1724 Superior Ave., Cleveland 14, Ohio, for a leading manufacturer of aircraft parts.

The machine is lead screw controlled at all times, yet has rapid approach and retraction of spindle. It is so constructed that

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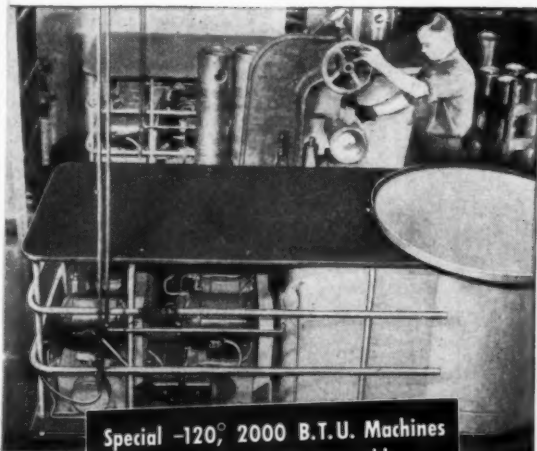


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Results from employing the Deepfreeze shrink-fit method are excellent. Rate of assembly is increased over former methods from 200 to 700 parts in 20 hours; only one operator instead of two is re-

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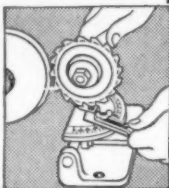
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lead screw assembly is never disengaged from spindle. The entire lead screw assembly slides in scraped ways. It is said to embody a specially designed locking device, so accurate that it can release and then again re-engage the lead screw assembly many times and the tap passed thru the same hole again and again, yet the work piece will retain the same class fit of thread as when tap was passed thru the work piece originally.



Rapid approach and retraction of spindle is controlled by two air cylinders which exert no air pressure on spindle when tapping. Rapid approach can be set to stop within .010" of hole to be tapped. The rapid retraction becomes effective the instant tap leaves work. Tap is removed at twice tapping speed. These

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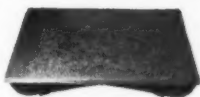
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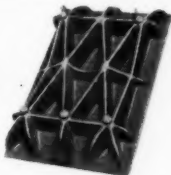
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factors make it possible to tap as high as 2,000 holes per hour.

Reversing mechanism is mounted on drive shaft and not on tapping spindle. It is actuated by two oppositely opposed bi-metallic clutches, one operating the forward or tapping cycle, the other operating the reversing cycle. Its action is so positive that vertical travel of spindle is controlled to within .005" limits and rotation of spindle is held to one-tenth revolution. This especially adapts machine for blind hole tapping.

Infinite speed is possible within the range from 40 to 400 rpm but higher ranges can be supplied. This is due to the special, quick adjustable variable drive which constantly revolves in the same direction. Motor also revolves in one direction and does not reverse for tapping cycle. The machine has a tapping capacity from $\frac{3}{8}$ " to 3" in steel and will tap Class 3 fit on a production basis, either right or left hand thread.

A dial wheel on left side of face of machine controls rapid traverse of spindle. The right dial wheel controls depth stop. Both wheels are graduated in thousandths. Rapid approach can be set in thousandths anywhere up to 5" of rapid approach. Depth control can be set from 1" to 6". Therefore it is possible to rapid approach up to 5" and tap 1" or rapid approach 1" and tap up to 5". A pilot light indicates when motor is running. Gauge on face of machine regulates exactly the right pressure on the clutch for whatever size of tap or die being used.

The bi-metallic clutch is said to be so sensitive it will slip when any additional torque is applied, thereby saving tap and work piece. A speed indicator is visible on face of machine so operator always knows the actual spindle speed. Emergency stop button is right in front of the operator's hand. All controls have been so placed operator has them at his finger tips at all times.

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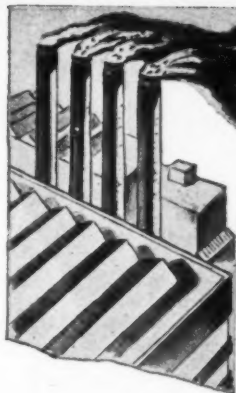
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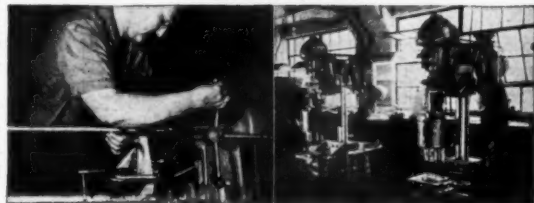
HERE'S HOW WALKER-TURNER MACHINE-TOOLS CUT COSTS!



The war years have proven to American Industry that the light machine tool has an important place in Production. Walker-Turner machine tools have demonstrated their ruggedness under most exacting conditions. Don't let pre-war operating methods affect your post-war competitive position. The versatility of Walker-Turner machine tools will ensure production equal to—and, in many cases, better than—heavier and more expensive equipment.

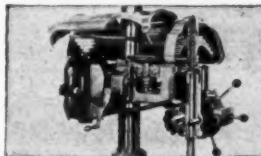
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Wide range of operating speeds enables you to select the optimum cutting speed for any material.



Walker-Turner flexibility saves time and cuts costs in special tooling set-ups. Set up horizontally, this Walker-Turner 15" Drill Press Bares the ends of tubing.

This Walker-Turner 20" Drill Press drills five holes and reams two holes in one operation.



Low power consumption reduces operating costs.

This motor on a Walker-Turner 20" Drill Press provides speeds for drilling up to $\frac{3}{4}$ " in steel 1" in cast iron.



Low price decreases capital investment.

This Walker-Turner 4-spindle 20" Drill Press costs no more than a single heavy unit, yet has several times its production capacity.

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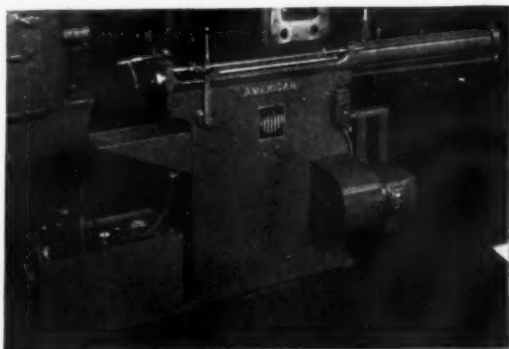
AMERICAN H-1-20 HORIZONTAL BROACHING MACHINE

A new model H-1-20 horizontal one ton, 20" stroke Broaching Machine is announced by American Broach & Machine Co., Ann Arbor, Mich. It is a fast and accurate, small machine which is said to include many large machine features. It is suitable for pull broaching and push broaching on certain types of work, also light push assembly jobs.

The draw head has long bearing with bronze take-up gibs. Ways are of steel, bolted in on the solid bed frame. Face plate is finished on full surface.

Inside face is finished to a size large enough to permit bushing to be used inside of bed in face plate for push operations. Control is by hand lever operating a 4-way hydraulic valve. Stroke adjustment is by means of stop collar which may be set for any length stroke.

Machine is designed for pull or push



broaching—20" maximum stroke. It is suitable for the use of pull broaches up to 23½" long. Maximum time for cutting stroke, full 20" maximum capacity, is 4½ seconds.

Variable speed is provided thru automatic diameter changing drive pulley, giving a speed reduction of 33-1/3% be-

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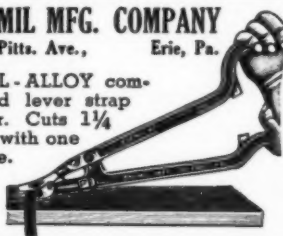
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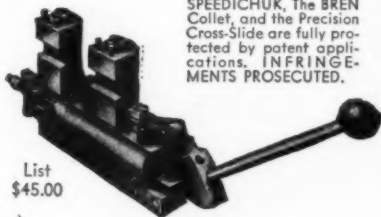
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Accuracy to .0001" is possible with SPEEDICHUK because of its unique floating closing ring and the BREN Collet, whose body taper conforms with the taper of the lathe spindle.

Centering to desired accuracy may be attained by tapping work, and indicating. SPEEDICHUK is ideal for tool room use or short production runs where speed in opening and closing on work is not essential. It requires no adapter plate and is easily fitted to the lathe.

..AND FOR PRODUCTION CUT-OFF WORK, FORMING, ETC.

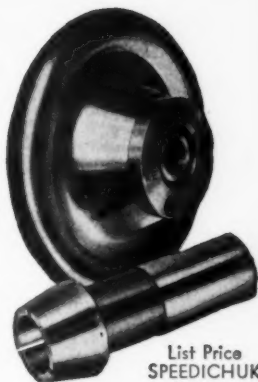
THE NEW Precision LEVER TYPE CROSS-SLIDE



SPEEDICHUK, The BREN Collet, and the Precision Cross-Slide are fully protected by patent applications. INFRINGEMENTS PROSECUTED.

List
\$45.00

• Order from your dealer or write us for literature.
GENERAL DIE-STAMPING-TOOL COMPANY
Precision Collet Division, 262-272 Mott St., New York 12, N. Y.



List Price
SPEEDICHUK
\$19.75
BREN Collets
Round \$4.50
Sq. & Hex. \$7.50

**IMMEDIATE
DELIVERY
FROM STOCK**

- Equipped with sensational tool leveling adjustment
— Maintains tool in absolutely horizontal position.

A sturdily constructed job, this Cross-Slide has no rack and pinion to become clogged with chips. Handle adjustable in three positions for convenience of operator. Has a five inch travel.

Three models fitting Atlas, Logan, 9" South Bend; can be adapted to most other bench lathes.



SEND US YOUR PRINTS FOR *Quotations*

THREAD GRINDING

Also Internal, External
and surface grinding.

BROACHING

SCREW MACHINE PRODUCTS

MAGNETIC INSPECTION

GEARS

SPUR BEVEL

WORM HELICAL



low maximum speed. (Approximate speeds are 18 to 24' per minute). Speed is quickly varied by cam lever back of motor mounting. Further details and specifications are available on request.



Here are two types of pull heads for connecting various styles of broaches. Upper one has three tapped holes for connecting broaches with threaded shanks, a single head being suitable for 3 different sizes of shank threads.

The other pull head is for round, square and other shaped broaches and is automatic connecting, being released by turning the broach slightly. All types of broaching tools as well as heads and fixtures are available for use with this machine.

Save Time IN CUTTING SHEET METAL!

GES-12 ELECTRIC HAND SHEARS

This handy electric tool will enable you to cut sheet metal in a fraction of the time required to do it by hand. Shears 6½ feet of 1/8" boiler plate per minute. Powerful enough to cut 14 gauge stainless steel. Cuts around small curves as well as along straight lines.

Weights only 12 lbs. Operates on AC or DC and 110 or 220 volts, 25 to 60 cycles.

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FOR
LITERATURE



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for Your
Postwar Needs!

Jefferson Engineering & Mfg. Co.
269 Walker Detroit 7, Mich.

FAST, UNIFORM PART MARKING...

If the metal parts you manufacture require accurate marking or numbering for easy identification, this improved Mercury Type Holder is an outstanding help in simplifying your marking job!

This tool holds the entire part number—up to 20 characters if needed. Each character is rigidly aligned and held in place so that, with a single blow of a hammer, the entire number is clearly and neatly stamped on the part. It's fast, fool-proof—and entirely eliminates the time normally consumed when using dies for each separate letter or figure. Moreover, such common errors as wrong sequence, strike-overs, overlapping numbers, etc., are no longer a problem with the Mercury method!

WITH THIS
Improved
MERCURY
TYPE HOLDER!



**INTERCHANGEABLE
TYPE**

And here's an outstanding feature: the Mercury Holder accommodates five type sizes, and all type is quickly interchangeable to meet a whole range of numbering needs. So, with even a single Holder and a selection of type sizes, you can be ready for any numbering job that comes along! The Mercury Holder is compact, important when working with small parts... it is of all-steel machined

construction for long life... it has just four simple parts... and it has many other important features you should know about. Hardened and ground hand cut steel type is available in a full range of sizes.

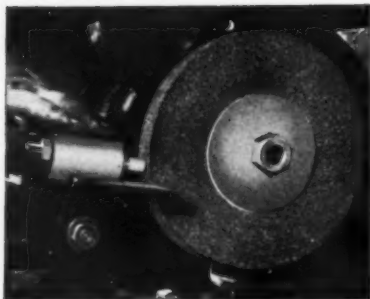
Full details, including ordering data and specifications for both hand and press style holders, are available for the asking. Write Department B today!



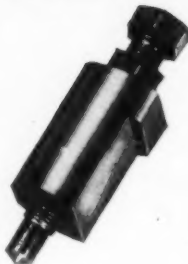
IMMEDIATE DELIVERY!

MERCURY METAL DIE AND LETTER CO.
546 EAST 16TH STREET, LOS ANGELES 15, CALIFORNIA

Save VALUABLE GRINDING EQUIPMENT



With a
WESTCOAST
Fool Proof
Diamond Wheel
Dresser



**Handy Adjust-
ment for proper
dressing of all
grinding wheels.**



**Write for free
illustrated catalog.**



WESTCOAST DIAMOND TOOL CO.

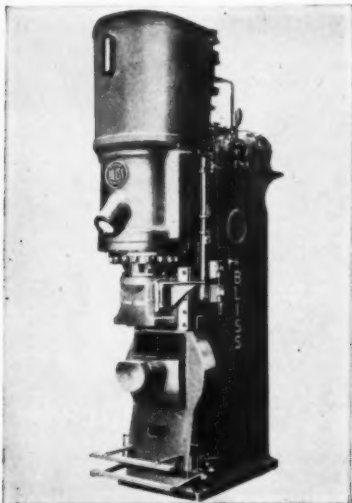
11601 WILSHIRE BLVD., LOS ANGELES 25, CALIF.

Telephone: ARIZONA 3-3147

HYDRAULIC HORN PRESS

A new horn press has been developed for the manufacture of automobile truck rims, embodying the Bliss Hydro-Dynamic Press principles.

The press frame is an extremely heavy and rigid steel casting in which the horn and the 300 ton hydraulic cylinder are mounted. Slide is well guided on the frame and can be provided with a shouldered slide cap if necessary.



As this press was required for coining work, a comparatively small 20 hp pump was installed, but larger pumps can be incorporated on the same press to provide higher speeds. The economy involved in using a small pump on coining work is quite feasible with this system, since its normally open prefill valve and positive drive to the work permits quick build-up of pressure. Cavitation is reduced to a minimum and the press itself is self-purging of air. Electric control by hand and foot button is provided with either automatic reverse, or reverse by the release of the foot treadle. The non-repeat device is incorporated in the automatic reverse.

This 300 ton press is one of a line of gap type presses ranging in capacity from 50 to 500 tons. The new design is modern and clean-cut with a minimum of pipe



AMES
Hundred Series
DIAL INDICATORS

In four sizes with fourteen different dial graduations, indicating thousandths, half-thousandths or tenths of thousandths inches.

Speedy, accurate, inexpensive and adaptable to various measuring and testing jobs.

Write today for catalog.

B. C. AMES CO.
 WALTHAM, MASS., U.S.A.

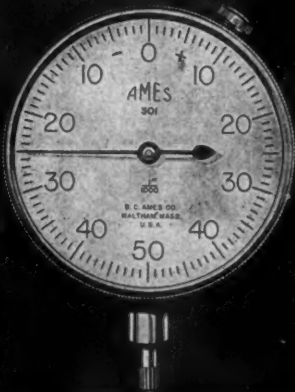
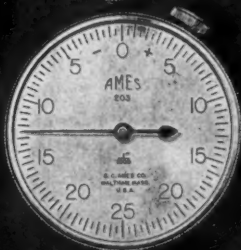




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AMERICAN PHOTOCOPY EQUIPMENT COMPANY

2849 N. Clark St., Dept. C-15

Chicago 14, Illinois

Representatives in principal cities and Canada

and other protuberances. Presses are available in the horn type as illustrated—table type for general shop work and the extended table type for straightening work. Hydraulic cushions in the bed are available when required.

Additional details can be obtained by writing to the E. W. Bliss Co., 53rd St. & 2nd Ave., Brooklyn 32, N. Y.

ARMSTRONG CARBIDE CUTTERS

Armstrong Bros. Tool Co., "The Tool Holder People" 308 N. Francisco Ave., Chicago, announce extension of their line of Armstrong Carbide Tool Holders and Armide Carbide-tipped Cutters. These tool holders, especially designed for use with carbide-tipped cutters, now come with "Straight" "Right-Hand Off Set" or "Left-Hand Off-Set" shanks, each in 7 sizes, while Armide Cutters come tipped with carbides of two grades—Armide Red for machining steel and Armide Gray, for machining cast iron, brass, bronze, aluminum and non-metals. All sizes of Armide Cutters come ground to 4 standard cutter shapes, and in two weights—standard or heavy duty.

These standard carbide-tipped tools, which have been designed for general use in tool rooms, machine shops and main-



tenance departments, will be sold thru industrial supply houses, either singly or in matched tool holder and cutter sets. The sets will be boxed in fitted steel cases.

Now even the smallest machine shop can have carbide cutting tools, can pick them up for a nominal price from stock at the nearest tool dealer. This is a significant change from the day when Krupp held the price at something over \$400.00 per pound and sales were restricted to exceedingly expensive form tools for only the largest large scale production operation.

Thread Ring Gages *Re-worked!*



WORN GAGES MADE LIKE NEW!

Ship us your worn thread ring gages and let us give them a new lease of life! We re-lap the worn threads on pitch diameter, re-lap the major diameter to sharp V, eliminate bell-mouth, enlarge the slots, and replace worn bushings, adjusting screws and locking nuts when necessary.

Unless the gages are so badly worn that they are hopeless, we make them as good as new — at a saving of 30% as compared with the cost of new gages.

NOTE: When sending special pitch-diameter gages, be sure to send also the setting plugs.

Thread Plug Gages

Now Available!

PREPARE FOR RECONVERSION!

You can save valuable time in postwar days by taking time now to arrange for the thread plug gages you'll need for peacetime production. A few days' delay at this time may mean months of waiting in the postwar period when our plant becomes booked with orders to the limit of its capacity. All standard sizes now available.

*Write for
Literature*

Quick Delivery Also
on Standard Ring Gages

Scientific GAGE COMPANY

15922 FENKELL

DETROIT 27, MICH.



NORFLEX POLISHING AND FINISHING WHEELS

Norton Co., Worcester, Mass., announces a line of solid polishing wheels marketed under the trade mark "Norflex". They are available in three types:—cork resinoid, fiber resinoid and resilient rubber, (l. to r. as illustrated). Together they make it possible to meet the special requirements of a wide range of de-burring, finishing and polishing operations—jobs which not so long ago were performed by slow and laborious hand filing, scraping and sanding.

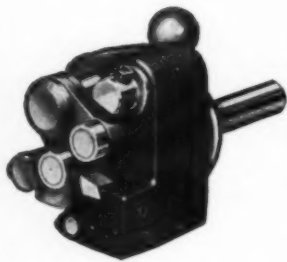
All three types of wheels and sticks are similar in that they possess relatively soft and flexible bonds that impart a cushion-like action, assuring a smooth uniform finish. They differ from conventional grinding wheels in that they are designed to remove only a relatively small amount of material such as a burr or sharp edge, or to polish a surface that is already to size. The three types of wheels differ from each other with re-



spect to the kind of flexible bond that supports the abrasive grains.

The fiber resinoid type has uniformly sized abrasive grains mixed with cotton fibers and held together with a resinoid bond. The mixture is pressed to the desired size of wheel or stick.

This bond provides a somewhat resilient, fast cutting action adapted to a wide range of de-burring and polishing operations. Outstanding feature of the wheel is its smooth cutting action which enables operator to remove burrs and break down



$\frac{5}{8}$ "

**FOR FASTER STOCK REMOVAL,
UNIFORM SIZE AND SMOOTH
FINISH, you'll find NEUBERT BAR
TURNERS fill the bill.**

They are easy to set up, hold to size, and operate with heavy cuts and feeds and roll the work to a smooth, burnished finish.

Speed your production with NEUBERT BAR TURNERS.

Three sizes — $\frac{5}{8}$ ", 1", $1\frac{1}{4}$ " capacity.

Send for literature.

NEUBERT MACHINE COMPANY

Precision Cutting Tools

341 W. Willow, Long Beach 6, Calif.

Whether 1945 is Really War's End Or We're Still Fighting Away

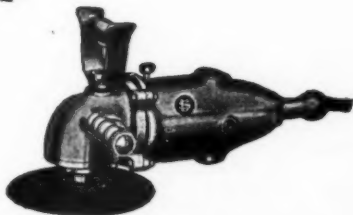
**UNITED STATES ELECTRICAL TOOLS ARE
BUSY ON ALL PRODUCTION FRONTS**

EVEN the seventh son of a seventh son can't tell you . . . but we can all hope, can't we? One thing we can promise you though, UNITED STATES ELECTRICAL TOOLS for 1945 will carry on with the same vim and vigor which have enabled users to lean on them for biggest production at lowest cost for many decades. It's a pledge!



**MODEL 14RG REGULAR DRILL
MODEL 14HD HEAVY DUTY DRILL**

Ball bearing throughout. Universal motor. Chrome nickel steel gears, heat treated, packed in grease and sealed. 3-jaw screw-back chuck; cable and plug.

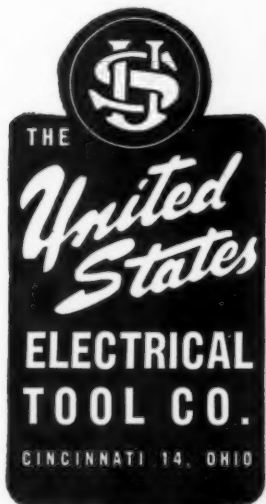


**MODEL SUG
SUPER SERVICE SURFACER**

Exceptionally powerful machine designed and built for heavy duty sanding, gouging, right angle grinding, planing or rubbing operations. Streamlined design with straight line ventilation which prevents clogging and assures cool motor operation. Air outlets divert dust-laden air away from operator.

FOR SANDING

**FOR GRINDING
FOR PLANING**





**a name to remember
when you think
of BETTER lathes**

A lathe is judged by the kind of job it does, and by nothing else. That one fact explains why Logan Lathes have made such headway. The men in the shops, and the executives as well, like the kind of job that Logan Lathes do. Here are four reasons why:

- Advanced engineering in the spindle mounting, in the countershaft, in the back gear arrangement, in the bed construction, and in many other points.
- More exacting standards and closer tolerances are maintained in building Logan Lathes.
- Logan Lathes are built in a new, modern factory, equipped with the best machinery and tooling obtainable.
- A management policy, stressing quality of production rather than volume, that has produced a personnel of loyal workers.



Further messages in this series will give you more reasons why it will pay to see your Logan dealer or get the Logan catalog before you buy a lathe.

A-5

LOGAN ENGINEERING CO.

CHICAGO 30, ILLINOIS



**a name to remember when you
think of BETTER lathes**

sharp edges of metal parts with speed, facility and assurance of obtaining a good finish.

Light tool marks resulting from milling, boring and offhand grinding operations can be polished out in short order without danger of leaving the part undersized.

Fiber resinoid wheels can be operated at the high speeds usually employed with organic bonded grinding wheels. In this respect they have an advantage over resilient rubber and cork resinoid grinding wheels in that they can be operated at 7500 sfpm in F, the softest grade, and as high as 900 sfpm in the hardest grades, G and H.

Wheels of the resilient rubber type are made with a comparatively soft rubber bond which imparts a cushion-like action.

Their range of application overlaps fiber resinoid wheels somewhat in that both types are used for de-burring, finishing and polishing work. However, they differ in the respect that resilient rubber wheels are not suitable for operation at speeds in excess of 6000 sfpm for the harder grades, D and E, while in B, the softest grade, 3300 sfpm is the maximum safe operating speed.

Cork resinoid types are made up of abrasive, resinoid bond and finely divided cork, the latter providing a soft polishing action. While these wheels, like the two other types, are used for many offhand polishing jobs, they will also find a most important application on precision polishing work in cylindrical grinders, centerless grinders, surface grinders and internal grinders.

These wheels are available in various bond contents, structures and with different densities of cork thus making it possible to meet widely varying conditions.

WINS PRODUCTION STAR

Carboloy Co., Inc., Detroit, recently was awarded a star to go on its "E" Pennant for meritorious home front production achievements.

In a recent study made by a major business publication, the application of tungsten carbide, was revealed as being regarded by industry as one of the four most important "general" metallurgical developments of the War.

With this metal produced at a rate 40 times that prior to the War, it has been possible to turn out vastly greater numbers of tanks, airplanes, guns, shell, etc., than would have been possible in the same period of time without its availability.



DURABONDED

TRADE MARK

This Startling Improvement in Coated Abrasives Gives **LONGER, COOLER CUTTING LIFE**

The latest Behr-Manning development, which hardens the adhesive bond, makes our metal sanding abrasives . . .

More resistant to heat — Less sensitive to humidity

A bond that resists heat gives more rigid support to the millions of cutting grains and also greatly retards any tendency to "load."

A bond less sensitive to humidity—whether the latter be in the material sanded, in the surrounding atmosphere, or both—extends cutting action for a longer time.

"DURABONDED" Coated Abrasives bring you both these advantages.

Reports from hundreds of metal sanding operations in the field—on high speed belts, discs and "gadgets"—show an average of 20% increase in cutting life at no advance in price.

If you have not tried "DURABONDED" abrasives, use the coupon.

BEHR-MANNING (DIVISION OF NORTON COMPANY) **TROY, N.Y.**

We would like to know more about "DURABONDED" Coated Abrasives.

FIRM NAME _____ STREET _____
CITY _____ ZONE _____ STATE _____
BY _____ TITLE _____

"MICROTAPE" FACILITATES MASKING

A new tape used for insulation of plating racks and for masking parts prior to selective plating is announced by Michigan Chrome & Chemical Co., 6346 East Jefferson Ave., Detroit, Mich.

Known as Microtape, it is the first product of its kind to be produced by an extruding process. This results in a slight-



ly curved surface which feathers out to uniformly light edges. This feature makes the tape extremely easy to apply and permits smooth over-lapping and a snug fit around surfaces.

It can be built up to any desired thickness and, by heating for an hour at approximately 300° F will fuse into an integral coating.

It offers effective resistance to all plating solutions, including DuPont Rapid High Speed Copper 180°-190° F., Bronze, Tin, Zinc, Chrome and Cadmium, and withstands under actual operating conditions, boiling hot cleaning solutions and pickling baths. It has high dielectric strength. Its smooth, glossy surface allows more thorough rinsing and drainage to minimize drag-out of solutions. It will not harden or crack after continued use and flexing in hot cleaners and plating solutions, but remains tough and permanently elastic to permit rough handling on steady production jobs. It has sufficient tensile strength to permit tight wrapping without breaking or tearing.

Microtape has no surface tackiness or stickiness but has exceptional properties of cohesion. If wrapping is not completed, a rack can be put aside without danger of tape unraveling. As racks can be used immediately after tape is applied, it is especially valuable for use on rush rack-plated jobs where the time element is important.

When Microtape is used for masking parts for hard chrome plating or selective copper plating prior to carburizing, it is quickly applied and no time-consuming hot sealing is necessary before it is used. The end is secured by a dab of sealing cement furnished for the purpose. It fits snugly in grooves and around shoulders, making it particularly useful in hard chrome work. After plating, tape can be quickly removed, leaving a clean, unmarred surface. It has been found that after removal, this tape can be used several more times before being discarded.

BRAZING MORTAR SHELLS

In an article entitled "Low Temperature Silver Brazing Used in Making Chemical Mortar Shell", Col. H. R. Lebkicher of the Chemical Warfare Service discusses the conditions and proper treatment for brazing with silver alloys, with special reference to the 4.2 chemical mor-



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FORM-GROUND CARBIDE TOOLS

CIRCULAR, FLAT AND DOVETAIL

Send prints for prompt quotations.

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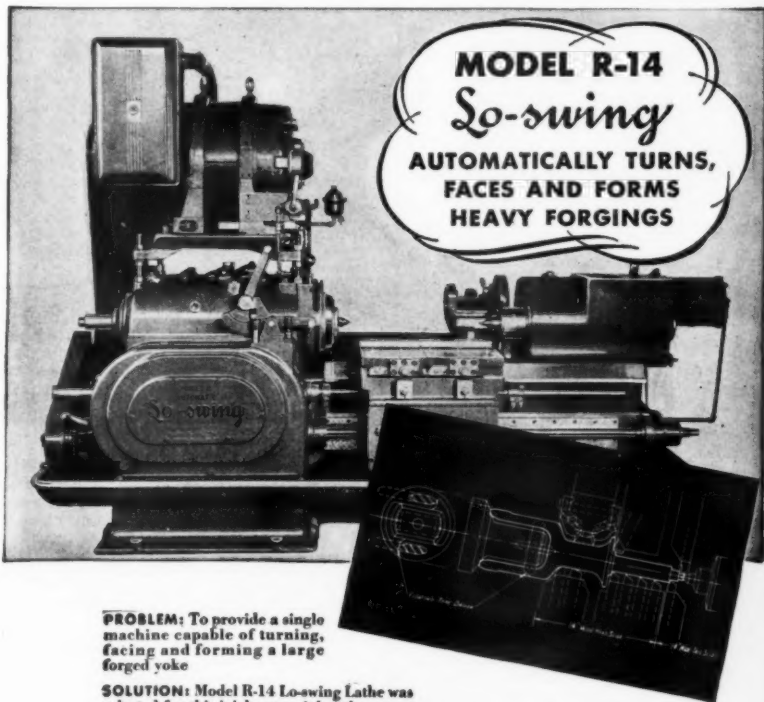
including 3/16" and 7/32"

Write for new reamer bulletins.

C. F. SCHMARJE CO., MUSCATINE, IOWA

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



MODEL R-14
Lo-swing
AUTOMATICALLY TURNS,
FACES AND FORMS
HEAVY FORGINGS

PROBLEM: To provide a single machine capable of turning, facing and forming a large forged yoke

SOLUTION: Model R-14 Lo-swing Lathe was selected for this job because it has the power and rigidity necessary for the wide form tools which machine the undercut section near the yoke, as shown in the tooling layout opposite. Turning of the undercut section and the stem is accomplished with six tools mounted in tool blocks on the head slide and a seventh tool, mounted on the independently-operated tail slide. Facing and forming tools are mounted on two independ-

ently-operated back slides. The one carrying the facing tool has a coarse feed, while the other has a fine feed suitable for the large, constant profile form tools.

Independently-controlled slides are one of the important advantages obtainable in Lo-swing design. Submit your turning problems to Lo-swing engineers for time-saving solutions.

LATHE NEWS *from* SENECA FALLS

THREAD-ALL Tapper



PRECISION TAPPING !! LICKED !!

**By Converting Any Drill Press into
a Precision Tapping Machine.**

Check these advantages:

Handles small taps without fear of breakage. Takes sizes up to 1½" with ease.

Gives precision tapping without need of lead screws.

Electro-magnetically controlled positive depth setting.

No adjustments required for tap sizes.

Silent forward and automatic high speed reverse action.

Taps right or left hand without adjustment.

Machine may be used for drilling, reaming, counterboring, etc. without adjustment.

Write for full details.

GRUEN GAUGE CO.

10039 Marcus Ave.

Detroit, Mich.

tar shell now being used by our armed forces. This shell consists primarily of a body with a base at one end, an adapter at the other, both brazed to the body with Easy-Flo silver brazing alloy.

Chemical cleaning and fluxing, and the properties and working temperatures of silver brazing alloys are discussed in detail, as well as operating methods involved in brazing.

A complete and well-outlined cycle of operations is shown, beginning with cleaning of the shell to testing for leaks in the final product. The advantages of low temperature silver brazing for war usages are pointed out.

Copies of this article may be obtained from Handy & Harman, 82 Fulton St., New York 7, N. Y.

GRINDING AND FINISHING

Four helpful new publications illustrating and describing the popular 3-M Method of Grinding and Finishing have just been released and are available upon request from Minnesota Mining & Mfg. Co., Saint Paul, Minn.

The largest booklet in this new series entitled "Step Up Production with the 3-M method of Grinding and Finishing" is designed to provide the latest, up-to-the-minute facts and information on this speedy, economical grinding and finishing method, in the most concise, practical and usable form. It is profusely illustrated with actual "close-up" shop photographs covering a multitude of grinding and finishing operations.

The three smaller booklets in the series deal individually with the 3-M Method as applied to grinding and finishing of small parts and tools, heavy duty grinding and finishing of flat or curved surfaces, and the 3-M Method employing a semi-portable unit for grinding and conditioning raw metal stock—armor plate, billets, sheets and tubes—and for cutting down large welded areas.

CUNNINGHAM BULLETIN

A new colorful 4-page bulletin describing their line of Safety Marking Tools is announced by M. E. Cunningham Co., 228 E. Carson St., Pittsburgh 19, Pa. Included are details on Letters, Figures and Symbols, as well as Holders.

According to the manufacturer, these tools will not spall or mushroom, and give deeper impressions.

Also included in bulletin is a page on the wide variety of safety date and inspection symbols available in Stamps.

They are constructed from patented Safety Steel, and are designed for all marking purposes, in hand or mechanical types.

Jessop

Improved **MUSTANG** **HIGH-SPEED** **STEEL**

FOR

**INCREASED
PERFORMANCE
GREATER ECONOMY
GENERAL PURPOSE**

The improved Mustang Tungsten-Molybdenum High Speed Steel is one of the most efficient, economical steels for general use. It is of the 6-6-2 type known as M-2, that has been thoroughly tested and found suitable for 75% of the tool steel requirements of motor car manufacturers.

Use of the improved Mustang offers greater production at lower cost through its performance, low price, and standardization of a single type for general use.

Your Jessop steel representative will be glad to consult with you regarding Mustang for your shop requirements.

JESSOP STEEL COMPANY

HEAD OFFICE AND WORKS: WASHINGTON,

PENNA.



PACKAGING CARBOLOY TOOLS

To permit still faster filling of quantity orders from stock of standard Carboly cemented carbide tools and blanks, Carboly Co., Inc., 11139 E. 8 Mile Rd., Detroit 32, Mich., is now stocking the most widely used types of standard tools and tips "packaged for shipment" in quantities ranging up to 100 per carton. The quantities of tools or blanks per package have been selected according to quantities or multiples of quantities of each item most frequently purchased.

Thus, turning, facing, and boring tools are packaged in lots of 12, 6, or 1; standard blanks for these tools in lots of 100, 50, 25, or 10; round boring tools are packaged in lots of 12 or 6; blanks for boring tools in lots of 100, 50, or 25; standard reamer blanks in lots of 100 or 50; standard scraper blanks in boxes of 25; standard pointed nose blanks in lots of 100, 50, or 25; and lathe and grinder center tips in lots of 50, 25, or 10.

Adoption of standardized stock packaging program has enabled the inclusion of a number of desirable shipping and protecting features without shipping delay which would be involved were the tools similarly packaged after order is received. For instance, cutting tips of all standard tools are dipped in hot plastic. When this plastic hardens, it forms a thick coating around the carbide which is impervious to water and most chemicals and acts as a cushion to protect carbide tip against shock. To remove the plastic, it is merely slit with a knife and lifted away from the tool.

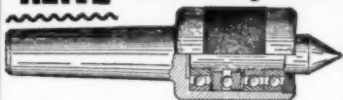
Boxes are of heavy cardboard treated to increase resistance to oil, water, and water vapor, reinforced by metallic stapling on vertical edges. The containers thus provide ample protection against accidental dropping or mishandling of tools



and blanks during shipping and storage.

Positive identification of tools and blanks in containers is provided thru different colored labels. Thus, tools and tips of Carboly Grade No. 883, the all-purpose grade for machining cast irons, non-ferrous metals, and plastics, are identified by a green label. An orange label identifies Carboly Grade No. 78B, most widely used "steel cutting" grade, etc. In addition, each label contains information as to size and type of tool; number of pieces in container; etc.

"ALIVE" Ball Bearing Centers



"They turn with the work"

Write TODAY — and let us tell you more about them.

MODERN MACHINE COMPANY
323 Berry Street BROOKLYN, N. Y.



KUTMORE ADJUSTABLE HIGH SPEED HOLLOW MILLS

16 standard sizes—Cutting capacities 1/32" to 2". Also specials made to order.

The KUTMORE is the only hollow mill with built-in micrometer dial adjustment. Prompt delivery — even on specials. Write for Catalog No. 15.

CARL WIRTH & SON, 1625 Clinton Ave., N, Rochester 5, N. Y.

WAR-TIME SHOP RECIPES

GROUND TAPS, THREAD GAGES,
THREAD HOBS & SPECIAL THREADING
TOOLS, SPECIAL TAPPING MACHINES



*Continuous
Precision
Tapping
with*

DETROIT

*light
duty tapping
machine
and simple
manual
fixture*

Tapping 3/4 inch 16 NF threads 1-1/4 inches deep (Class 3 Fit) in a blind hole takes less than 10 secs. per part in continuous production on this "DETROIT" LTM lead screw tapping machine.

Virtually eliminated rejections. Drive to tap is taken off base of lead screw eliminating wind-up effect.

High production rate achieved made additional machines unnecessary to maintain required production.

Other features of the "DETROIT" Light Duty Tapping Machines include:

Adjustable tapping head.

Full length triple tap-spindle guides.

Three selective spindle speeds.

Multiple disc friction clutch reduces tap breakage.

Lead screw is hardened and ground. Two-piece bronze nut. Completely enclosed. Quickly interchangeable.

For complete information ask for Bulletin #LTM-44.



8432 BUTLER
DETROIT 11,
MICH., U.S.A.

SMALL BUT MIGHTY



WALTON Broken-Tap EXTRACTORS

Yes, small in the amount of tool crib space they occupy, but a MIGHTY tool when put to the task of removing a broken tap. Walton Tap Extractors get at those broken taps and complete the job without loss of valuable time.

Simple and easy to operate.

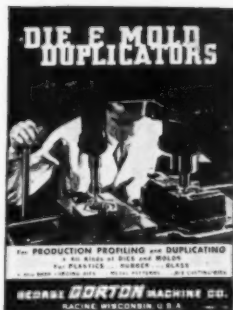
List Prices from \$1.50 to \$5.00 each.

Immediate Delivery!

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The WALTON Company
94 ALLYN STREET · HARTFORD, CONN.

DUPLICATOR BULLETIN



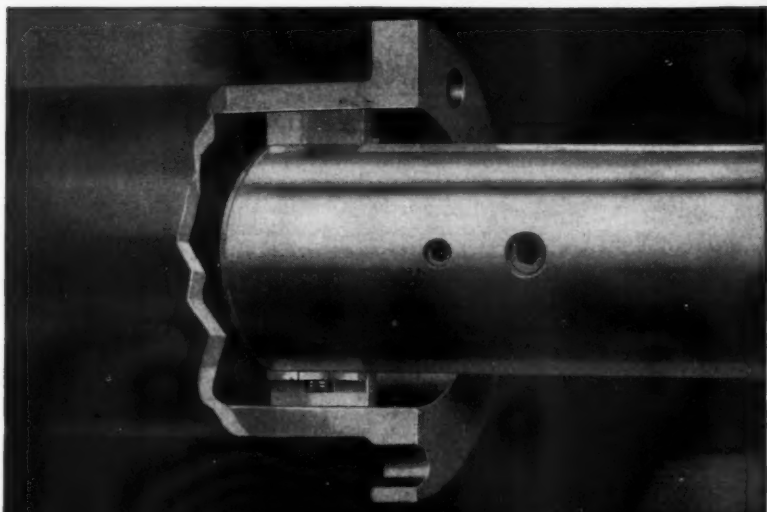
Three models of Die and Mold Duplicators, 8-D, 8½-D and 9-J, manufactured by the George Gorton Machine Co., 1409 Racine St., Racine, Wis., are described in the new 12-page Gorton booklet, designated as Bulletin 1319-E. Gorton Duplicators, which are applied also to production profiling, are used on dies and molds for all types of materials such as Plastics, Rubber, Glass, etc., also for Drop Forging dies, Metal Patterns and Die-Casting dies, as shown in the Gorton booklet. In addition to the data and specifications on the Gorton Duplicators, Form 1319-D includes a comprehensive Duplicator Table and Tracer Head Specifications Sheet. Copies of this Gorton bulletin are available free, upon request.

AUTOMATIC THREAD MILLING

A modern high speed precision machine tool for external and internal thread cutting is the U-6 Automatic described in a new 16-page illustrated bulletin issued by Universal Engineering Corp., Cedar Rapids, Iowa. Contents include engineering drawings, cutaway views and views of various types of operation, tables of measurements and typical threaded parts made on the U-6.

Eleven advantages listed for the U-6 Automatic and claimed by the manufacturing industry number high production, extremely accurate hobbled threads, internal or external threads, straight or taper threads, handling any standard or special thread form, making right or left threads, performing close shoulder work, fast accurate milling of cylindrical forms and lowest cost production quality considered.

Bulletin No. 1044 will be sent on request.



SIMPLICITY OF DESIGN AND OPERATION FOR **LOWER COST PER HOLE**

Madison's streamlined simplicity in design and operation are reflected in the final costs of the multitude of products being reamed by Madison Production Reaming tools. Check the six basic reasons for Madison's rock-bottom efficiency listed below. Put these six values to work on the production reaming problems in your plant.

- 1.** Greater chip clearance. Two blades finish ream to tolerances of .0002. Less heat and friction results in a truer hole, better finish and longer tool life.
- 2.** Less maintenance time. The two-bladed cutter requires less actual time for regrounding. Cutter can be ground and reset to its original or any given diameter in a few minutes.
- 3.** Greater speeds. Because of Madison's freer cutting action faster speeds are possible. A more sustained production operation is maintained for a longer period of time.
- 4.** Longer life. The Madison cutter can be expanded to make up for wear and regrounding. The

Madison one-screw adjustment feature enables a quick accurate adjustment of the cutter to its original size.

5. A Madison cutter can be slipped from any Madison bar and a new or sharpened cutter inserted in its place without disturbance to the original set-up. Interchangeability of cutters and bars allows different sized cutters to be used with one set-up of a Madison bar.

6. Controlled float. The Madison cutter is floated at the point where the cutting action takes place. No special floating tool holders and chucks are necessary. With Madisons floats can be indicated for greater uniformity on long-time production jobs.

To better solve your reaming problems, write for the new Madison catalog . . . shows complete lines, prices and grinding instructions. ➔

MADISON MANUFACTURING COMPANY
WULF & SPRING STS.,
MUSKEGON, MICHIGAN



KELLY HOSE COUPLINGS

TROJON AIR HOSE COUPLINGS

Malleable Iron — Rust-Proofed

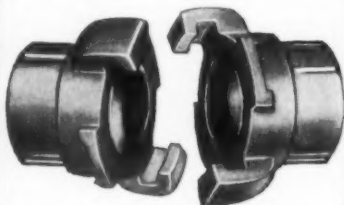


UNIVERSAL TYPE—Locking heads of all styles and sizes interchangeable from $\frac{1}{4}$ " to 1".

QUICK-ACTION—Instantly connected or disconnected with one quarter turn.

TIME TESTED-DEPENDABLE. Manufacturer of these couplings since 1921.

KELLY HY-WAY COUPLERS.
 $\frac{1}{4}$ " - $1\frac{1}{2}$ " - 2" Sizes.



U. S. Patent No. 2,250,199

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Distributors in most principal cities.

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CHICAGO

MACHINERY COMPANY

HOSE COUPLING DIVISION
2524 W. MADISON ST. CHICAGO 12

BORCOLOY TOOL BITS

Borcoloy (Boron-Cobalt-Alloy) is the name of a new ferrous cutting alloy with outstanding wear resistance (Boron) and red hardness (Cobalt) characteristics.

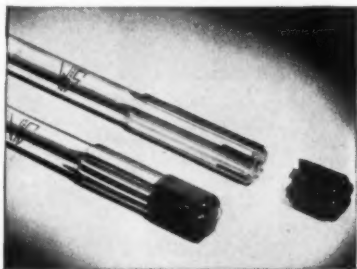
It is claimed that a unique method of centrifugal casting renders possible the incorporation of these two potent elements to the basic alloy. Room temperature hardness may reach high values when needed (Rockwell C-70 or even better). Two grades are available:

Grade 5 with 12% Cobalt is recommended for hogging and heavy duty cutting on high alloy steels, heat-treated bar stock or forgings.

Borcoloy is made by General Aircraft Equipment, Inc., Tool Division, South Norwalk, Conn., and a complete line of tool bits will soon be available to the metal working industries.

PROTECTING CARBIDE TOOLS

Damage to carbide tipped tools in transit, stockroom or toolroom bin should be considerably reduced by a new protective device now used by Wendt-Sonis Co., Hannibal, Mo., and applied to all this company's carbide tipped tools.



The protection involves application of a strong plastic coating to each tool tip immediately after final inspection at the plant. This hard and durable covering remains in place until inspected by the purchaser and then it can be slipped back over the tool tip to afford permanent protection in the tool bin. Altho the covering is air-and-moisture proof after initial application, it will not leave any gummy residue on working surfaces when removed from tip.

In addition to this new plastic covering, all W-S tools are still packaged in the brown and yellow, tool-protective cartons.



Copper Head Laps are Economical to Use. The only Wearing Part is the Replaceable Copper Sleeve.

COPPER HEAD LAPS PAY FOR THEMSELVES IN TIME SAVED

Costly tool room time is saved when you use Boyar-Schultz Copper Head Laps. They are also fast working . . . a double saving. Copper Head Laps never wear out; sleeve adjustment feature permits maintaining correct lapping size till worn out when it is replaced with a new sleeve. Available from Stock in standard sizes, $\frac{1}{8}$ " to $2\frac{1}{2}$ ".

BOYAR-SCHULTZ SMB MACHINE BOLTS SAVE the Machine - SAVE the Job - SAVE Time

Heat treated alloy steels make them TOUGH for heavy work; machined heads and carefully cut threads make them ACCURATE for the most exacting tool room work. Heads are machined square with bodies, presenting a clean, flat surface to the T-Slot. Work is held tightly under heavy machine cuts. Close adjustments are possible.

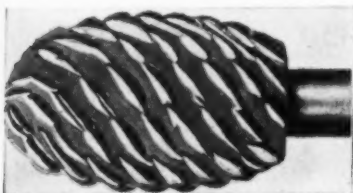
Avoid worn or poorly made bolts. They can cause costly damage to machine beds, ruining the machine's accuracy. For best results, use SMB Nuts and Washers. They are specially made for use with SMB Bolts.



BOYAR-SCHULTZ CORPORATION
2108 WALNUT STREET CHICAGO 12, ILLINOIS

GRAHAM SUPER-CUT FILES

A new type of rotary file has been developed by the Graham Rotary File & Tool Co., 387 Fourth Ave., New York 16, N. Y.



Called the Graham Super-Cut (pat. pend.) it combines the features of both hand cut and ground product.

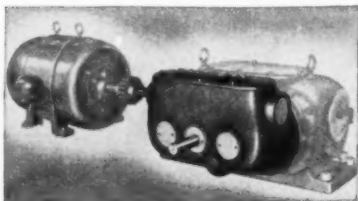
The makers emphasize that it has the hand undercut tooth to prevent chattering; forged hammer surface for additional toughness; the ground edge for perfect symmetry; the fluted tooth to prevent clogging; the newest type of hardening known as Sub-zero Process and a Nitrided surface to give the teeth greater durability.

It can be used on any type of metal or

plastic or tough steel alloys. Can be run at extremely low or high speeds and is available in fine, coarse or extra coarse cuts. Can be run in any drill press, electric or pneumatic portable tool and can be resharpened at a fraction of its original cost.

DIFFERENTIAL VARIABLE DRIVE

Designed for applications not now covered by any mechanical or electrical device, this new differential variable-speed drive consists of two mechanical differentials and a standard variable speed reducer. Using an 1800 rpm squirrel-cage motor as a source of power, output speed can be obtained from 0 to 800 rpm in one direction, or from 400 rpm forward thru 0 to 400 rpm reverse.



Distinctive feature of the unit is the fact that torque remains constant thruout entire range.

The unit illustrated is designated as No. T3. It is made by utilizing Link Belt PIV No. 3 and two mechanical differentials. Torque capacity of this unit is 750 inch-pounds thruout entire range. Other units of the line may be supplied to provide up to 2100 inch-pounds torque thru the same speed ranges. Smaller units are also available.

By means of a control box furnished with unit, output shaft can be made to duplicate any movement of control shaft. Control shaft may be operated with but a few inch-pounds torque while output shaft will deliver full power of unit.

In the differentials, bevel gears are made of alloy steel, case hardened and mounted thruout on anti friction bearings. Worms are hardened and ground and worm gears are made from best grade gear bronze. This, together with the fact that these are low ratio, high helix angle worm gears insures high operating efficiency.

Many variations of the basic unit, designed for specific applications may be supplied. Manufactured by The Ohio Gear Co., 1335 E. 179th St., Cleveland, Ohio.

CHANGE THE ANGLE AND YOU CHANGE THE PATTERN



using only straight knurls

Handles work
up to 2 1/2" dia.,
shank to fit
your turret.
Simplifies the
tool problem.



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ALL STANDARD SIZES

National Coarse
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0-80 to 1½-6



WHEN you need standard Thread Plug or Thread Ring Gages in a hurry, you'll save time by ordering them from Cadillac. As a rule, all orders received by 4:00 p.m. are shipped the same day.

As manufacturers of thread gages exclusively, serving many companies which use gages in exceptionally large quantities, we carry an unusually complete stock of thread gages in all standard sizes.

If you are having difficulty in securing quick deliveries of gages, wire Cadillac! The chances are we have in stock the exact sizes you need, ready and waiting to be packed and shipped.

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THE "ONE-MAN" HAMMER
FOR TEN MEN'S WORK

SYNTRON
REG. TRADE MARK

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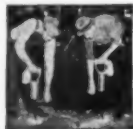
ELECTRIC HAMMERS



With Only One
Working Part
the "PISTON"

Can SAVE You —

\$4.00 every hour they're used —
that amounts to \$160.00 per week.



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CUTTING



SCALING



REDRESSING

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Homer City, Pa.

FLEXIBLE SHAFT HANDBOOK

A new second edition of the Flexible Shaft Handbook has recently been issued by the Industrial Div., of S. S. White Dental Co., 10 E. 40th St., New York 16, N. Y. This attractive 256-page manual completely covers the subject of flexible shafts. It gives full information and engineering data on the two broad classes of flexible shaft applications — power transmission and remote control. It presents a comprehensive picture of the range and scope of available shaft equipment in each class, including illustrations and descriptions of many actual applications.

It explains in detail the procedure of making flexible shaft applications, including selection of the right shafts for specific conditions with instructions for working out all of the application details. A considerable amount of helpful engineering data is included in this interesting and useful volume, which is substantially bound in a handsome red fabricoid cover.

It will be sent free to any engineer who has an immediate or possible future interest in flexible shafts. In writing use your company letterhead and indicate your title or position.

BELTING SELECTION

A new leather belting selection and application manual provides a simple, non-technical approach to a subject that frequently is permitted to become involved. This 56-page manual offers data, charts, and specifications to support these headings—how to pick the right leather belt for the job, including information on tanages, figuring of belt dimensions, etc.; how to decide between Modern Group Drive and Automatic Tension (pivoted motor base) Drive; how to compare efficiency and cost of Multiple V-Belt Drives and Flat Leather Automatic Tension Drives; how to figure Flat Leather Automatic Tension Drives; how to figure Flat Leather Belt prices; how to install Flat Leather Belts properly; how to make belts deliver more power and last longer. The manual includes a brief catalog section of leather belting and accessories. It is an excellent reference book for anyone interested in power transmission. For a copy write Graton & Knight Co., 356 Franklin St., Worcester 4, Mass. Attention Merchandising Dept.

A REVOLUTIONARY METHOD FOR REMOVING EMBEDDED TOOLS

Write, wire, or phone for bulletins



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Electrodes**

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\$295

Representatives in key cities

Removal of embedded tools by Drafto's "vibrating arc" preserves delicate threads and contours in dies and production pieces—saves work you formerly scrapped. Compact, portable, easily handled. Disintegrator head operates in any position; makes round, square or special holes according to size and shape of electrode. Anyone can use it. Engineering representatives will demonstrate in your own plant—on your own materials.

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BLADES

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VICTOR

1 For faster cutting of hard, soft metals and others materials.

2 Sharp hardened tooth-edge cuts clean and deep; accurate set eliminates clogging and leaves cut surface smooth; finest high speed steel, scientifically heat-treated, gives a more durable long lasting hack saw blade.

3 Booklet, "Metal Cutting" gives helpful hints on care and use of hack saw blades and other VICTOR products. Send for a copy today. Victor Saw Works, Inc., Middletown, N. Y.



VICTOR

Makers of hand and power hacksaw blades, frames and metal cutting band saw blades.

7228

HIGH SPEED INDICATOR

Moore Products Co., H & Lycoming Sts., Philadelphia 24, Pa., announces a new high-speed indicator for use with their Pneumatic Comparator Gages. These production gaging instruments are applied to dimensional inspection of I.D., O.D., thickness, contour, center distance, and combinations of several dimensions to tolerances of .0001" or less. Precision gaging, at rates of 600 to 1000 pieces per hour, is accomplished thru use of this high-speed indicator, and new advantages in shock-proof performance, positive action, and continuing accuracy are claimed for the new design. Tests have been run, in which indicators have been subjected to as many as 2,500,000 gagings without deviation in readings.



The new indicator utilizes a special wide bourdon tube, which is said to develop from four to five times more pointer torque than indicators previously available. Between indicator and gaging unit is a flexible diaphragm seal. All cavities above diaphragm, including interior of the wide bourdon tube, are filled with a special liquid. Air pressures that correspond to the sizes of work pieces being gaged are transmitted thru diaphragm, and indicate on dial.

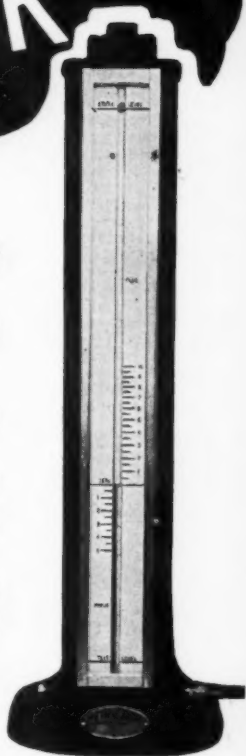
The **METRICATOR**

For **PRECISION MEASUREMENTS of**
INTERNAL DIAMETERS
EXTERNAL DIAMETERS
TAPER AND STRAIGHTNESS
SLOTS AND THICKNESS
CONCENTRICITY AND ALIGNMENT

All **METRICATOR** gages are custom-built—engineered to meet your specific needs, assuring you of greater adaptability and guaranteeing precision accuracy.

METRICATOR gages eliminate human element variations and maintain their high degree of accuracy for a longer period of time in spite of wear.

SEE THE METRICATOR IN OPERATION
IN YOUR OWN PLANT . . . SOLVING
YOUR TOUGHEST GAGING PROBLEM.



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Metrical Laboratories, Inc.
ANN ARBOR, MICHIGAN

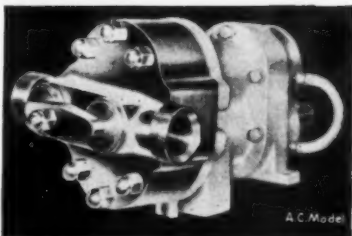
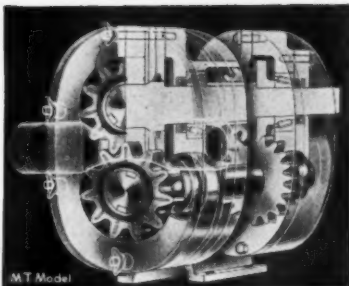
FLOW-MASTER PUMP

A transfer, metering, proportioning pump,, said to maintain its volumetric efficiency against normal wear, has been developed by Marco Co. Inc., 513 Monroe St., Wilmington 17, Del.

Features stressed by the makers are positive displacement, constant volume and high vacuum. They assert the Flow-Master will transfer, meter or proportion any product that can be pumped. It maintains a steady, non-pulsating delivery, and there is no churning or foaming. In addition, it is easily cleaned. The precision-built parts of the Flow-Master are interchangeable. The pump rotors are hydraulically balanced. Seals are of the single-gland type, housed in stainless steel armor, requiring no adjusting and are readily removable for cleaning. The tapered roller bearings run in oil and no bearings are exposed to product contamination.

Standard pumps are built in capacities for all standard ranges.

Ten different standard models are listed, with head pressure ranging from 65' to 750 psi. Ratings in gallons per hour at 600 rpm range from 400 to 2150, and at 1800 rpm from 1200 to 6450. A new bulletin gives complete details.



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GAUGES ...
Taper, Build-Up
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Any type of Tool,
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Work to your
specifications.

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THE
JAP'S
"CHOPPERS"**

Mr. Jap knows
now that he has
bit off more than
he can chew ...

And Adolf realized his mistake
long ago. Let's all work harder to
finish 'em off in a hurry. Bone
Tool and Gauge are doing their
part.

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PLASTIC DIES,
WHITE METAL DIES**

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DETROIT 27, MICHIGAN

The Sunnen Precision Honing Machine — with New Coolant Pump and Base —

Provides
**GREATER HONING SPEED
and ACCURACY**

With the addition of a new base that contains a pump for supplying honing fluid, the Sunnen Precision Honing Machine is setting new standards of accuracy. Honing is faster, too. The honing fluid carries away all cuttings, keeps the abrasive stone sharp, and cools the part being honed.

With the Sunnen Precision Honing Machine, accuracy is guaranteed to be within .0001"—and has been held to .000025". A super-smooth finish can be produced. On certain types of metal, a finish of 2 to 3 micro inches can be obtained.

- Hones and finishes cylinders from .106" to 2.625" in diameter
- Can be used in either ferrous or non-ferrous metals—plastics—ceramics, etc.
- Does not require skilled labor
- No jigs or fixtures needed
- Economical to operate
- Can be set up to operate in one minute

Write for a free bulletin giving details about this low-cost honing machine—or ask a Sunnen engineer to show you how it can be used on your jobs.

The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.



SUNNEN



Typical Jobs



Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping—and gave a straighter hole.



Header Die. Life of header dies increased 3 to 9 times over lapping. Knock out pin breakage practically eliminated.



Aircraft Instrument Panel Control Wire Bushing. Hole .187" diameter—held to .0002", stock removal .001", sixty per hour.



Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.



Stainless Steel Lead Compensator Valve Seat. Hole is honed to .0002" limit.



Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.



Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.



Aircraft Carburetor Operating Valve Sleeve. Sunnen honing eliminates distortion from assembling operation.



Roller Bearing Outer Race. Finish improved from 12 micro-inches to 2 micro-inches.



Bearing. A very small part. 2 micro-inch finish necessary.



Carburetor Idle Valve Jet. Hole is honed after reaming for smooth action.



Shell Loading Die.

SUNNEN PRODUCTS COMPANY, 7935 Manchester Avenue, St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

RESISTANCE WELDING

One of the most unusual, comprehensive, and informative pieces of literature ever published in connection with resistance welding has just been made available by Progressive Welder Co., 3050 E. Outer Drive, Detroit 12, Mich. Entitled "Resistance Welding at Work", (Bulletin WP-44) it is in the form of a 60-page two-color 11 by 8½" book containing scores of illustrated examples of resistance welding applications.

The book is a striking commentary on the tremendous increase in scope and application of resistance welding during the war and immediate pre-war years. It is designed primarily as a guide to the wide variety of uses to which resistance welding adapts itself—whether it be single spot or multiple spot, seam or flash, butt or projection welding—and whether the work is to be brought to the machine or the equipment brought to the work in fixtures.

MILLING MACHINE CATALOG

A new illustrated 50-page Milling Machine Tools and Accessories catalog has just been issued by the Kearney & Trecker Products Corp., Milwaukee.

The Catalog, No. C10, gives complete

listings and information on arbors, cutters, vises, high speed attachments and center scope for every standard milling machine.

The particular value of this new catalog is its arrangement which makes information easy to find. By giving comprehensive information and listings on all types of Milling tools and accessories it likewise provides a single source of reference and supply.

FOSTORIA INDUSTRIAL SERVICE

Post-war infrared equipment and its application to industrial operations is discussed in a brochure recently issued by the Fostoria Pressed Steel Corp., Fostoria, Ohio. They point out that the new equipment designs make possible the most economic utilization of infrared energy. They also emphasize that from the standpoints of initial investment and operating costs, it provides the user with more for his money than ever before. The company maintains industrial service centers in many large cities in U. S., all of which are listed in their brochure. Interesting illustrations, diagrams and descriptive material give the reader an understanding of their new industrial service.

IMMEDIATE SHIPMENT!

STEEL BOXES



*for your
Production
Needs*

STACKING BOXES

An ideal all-purpose shop box. Sturdy all-welded construction; drop handles each end. Skids act as a positive stacking lock and re-inforce box at point of maximum wear.

No. 301—6" x 9" x 3½"	— 20 Gauge.....	\$.55
No. 302—8" x 12" x 4"	— 20 Gauge.....	\$.60
No. 303—9" x 13½" x 4½"	— 19 Gauge.....	\$.75

Prices F. O. B. Factory, Philadelphia

AMERICAN METAL WORKS, INC.

1502 GERMANTOWN AVENUE

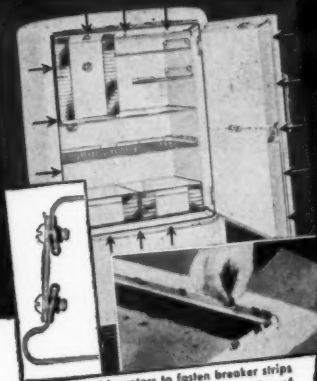
PHILADELPHIA 22, PA.

"J"

THE Type SPEED NUT

ALSO *Improves*

ASSEMBLY OF
PEACETIME
PRODUCTS



"J" nuts are used on refrigerators to fasten breaker strips to inner and outer panels. They are slipped over edge of flanges and extrusion in lower leg of SPEED NUT snaps into register with screw holes. They eliminate topped strips and permit a perfect seal by preventing a gap between assembled parts.



In electric range assembly, "J" type SPEED NUTS are used in heavy-duty applications. Here the one-piece top and splasher is fastened firmly to end panels with a resiliency that absorbs stress caused by expansion, thus preventing enamel damage.

WIDELY used prior to the war and now being used extensively on war materials, "J" nuts will be in still greater demand for peacetime production. For "J" nuts are a faster and more economical means for blind location fastening. Quickly snapped by hand into screw-receiving position, they do away with expensive welding, riveting, and staking. Their spring tension lock assures a positive fastening that eliminates vibration loosening—and has sufficient resiliency to prevent damage to enamel, plastic or glass.

"J" type SPEED NUTS can be designed into your products . . . let us show you how they will simplify and speed up your assembly and reduce costs. Send us your assembly details and we'll gladly rush samples.

VINNERMAN PRODUCTS, INC.
3307 FULTON ROAD, CLEVELAND 13, OHIO

In Canada: Wallace Barnes Co., Ltd., Hamilton, Ontario
In England: Simmonds Accessories, Ltd., London



Speed Nuts

FASTEST THING IN FASTENINGS

January, 1945

MACHINE TOOL BLUE BOOK

THE BASIC PRINCIPLE
of Spring-Tension Lock is
Embodied in all Speed Nut Designs

315

VITRIFIED DIAMOND WHEELS

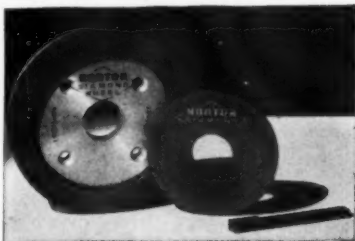
Development of a vitrified bonded diamond wheel is announced by Norton Co., Worcester, Mass. This new wheel supplements the resinoid bonded diamond wheel introduced in 1934 and the metal bonded diamond wheel introduced in 1939. These three types of Norton diamond wheels make it possible to meet requirements of all kinds of carbide tool grinding, as well as grinding of glass, quartz crystals, porcelain and similar materials.

Outstanding feature of the vitrified bonded diamond wheels and hand hones is the combination of a fast-cutting action with extremely long life. In one plant, for example, a Norton vitrified bonded chip breaker wheel ground 2404 tools with $\frac{1}{8}$ " wear compared to 1350 tools with $\frac{1}{4}$ " wear for a resinoid bonded diamond wheel.

In another plant, a similar wheel showed a faster cutting action than resinoid bonded diamond wheels and no appreciable corner wear after grinding 200 chip breakers. In fact, it is this ability of the vitrified bonded diamond wheel to hold a sharp corner and postpone development of radii much longer than resinoid bond-

ed wheels that makes it so advantageous for chip breaker grinding.

Another advantage is its ability to grind shank steel with little tendency to glaze or load. This characteristic is especially valuable where a relatively large area of steel must be ground with the carbide tip as in the case of cutter blades.



Norton vitrified bonded diamond hand hones and 4 and 6" diameter chip breaker wheels are available now. Large scale production of the popular 6x $\frac{3}{4}$ " cup and other sizes will start early in 1945.

THRIFTMASTER DRILLHEADS

The Thriftmaster Products Division of Zimmer-Thomson Corp., 29-05 Review Ave., Long Island City, 1, N. Y., offers a 16-page brochure describing its design of improved Multiple Spindle Drillheads. A variety of drillheads is shown along with cutaway views of both drillheads and their accessory equipment. A new spindle of unique design, permitting very close and simple depth adjustment of .0015" increments, is featured. The line includes adjustable drillheads of 2 or more spindles with a positive locking device. The catalog also contains a graphic description of multiple machining and drilling operations for reducing production costs.

STRAIGHTENING PRESS BULLETIN

Its line of new hydraulic straightening presses, Model VL-1, designed for handling both finished and rough work, is described in Bulletin No. VL1-44, available from Colonial Broach Co., P. O. Box 37, Harper Station, Detroit 13, Mich. These open side presses are of rugged reinforced welded steel construction with built-in motors. Rams are operated by direct-acting hydraulic cylinders in the heads and are accurately controlled thru light-pressure combination hand control and foot pedal. Standard and extra equipment are listed and specifications given on models ranging in capacity from 10 to 50 tons.

ANNOUNCEMENT

ALUMINUM HANDLES, American Gage design, may now be had in Colors.

**GOLD, BLACK, BLUE,
MAROON**

Delivery from Stock.

Also
Thread Measuring Wires
Lapping Compounds
Gage Rust Proofing
Gage Blocks
Plug Gage Blanks
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**AMERICAN GAGEMAKERS
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Proven Performance

SPECIFY CURTIS

Universal joints play an important part in the operation of airplanes and machine tools.

Where out-of-line transmission of power, or rotation of shafting around corners or at angles is necessary — strains and wear on universal joints working at such angles are excessive.

Engine controls — retractable landing gear — auxiliary power controls and elevator spars must have smooth, positive operation for the pilot and his crew.

In machine tools too — failure of any part means loss of production and costly repair shutdowns of multiple drill presses, grinders, milling machines, etc.

Curtis Universal Joints, made to Curtis "Standards" have PROVED their ability to "take it." The rigid Army Air Corps Class 1 specifications for strength and toughness are met and surpassed by Curtis Joints.

Through years of experience Curtis applied special steels and developed proper heat treatments to secure maximum strength and toughness. Accurate machining and fitting to close tolerances gives smooth, free-working surfaces — Curtis oilers insure proper lubrication — and the patented "Telltale" lock ring tells at a glance that each part is firmly locked together and permits rapid disassembly and reassembly in the field.

All these plus magnaflex inspection by certified operators give Quality Control thruout production.

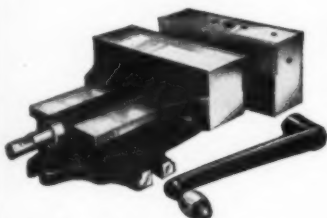
Specify Curtis Universal Joints in any of their 14 sizes — let Curtis Engineers work with you on your problems — be sure of "Proven Performance."

On the Ground

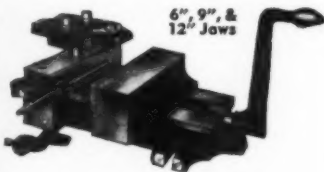
NOTE: End of Curtis patented "Telltale" lock ring is readily visible — showing that joint is perfectly locked together.

C CURTIS UNIVERSAL JOINT CO. INC.
 SPRINGFIELD, MASS. • BOSTON GEAR WORKS, NO. QUINCY, MASS., SOLE DISTRIBUTORS

GRAHAM MULTI-PURPOSE VISE



A standard vise—plus a many-purpose jig or fixture.



Sold plain or with jig attachments.

This vise handles an amazing variety of work, positioning plain and irregular shapes accurately for repeat-operation work. V-jaws, shell jaws, drill guides, stops, etc., all combine to make this a widely adaptable ready-made jig or fixture. Sizes for all machines, up to 124 lbs. for shaper and planer.

Request Illustrated Price Circular

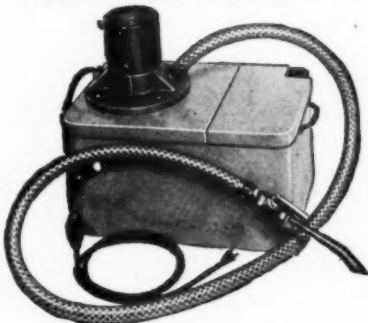
GRAHAM MFG. CO.
51 Bridge St., East Greenwich, R. I.

"PINCH-HITTER" PORTABLE

Brady Pump Co., Muncie, Ind., has added a portable tank coolant pump to its popular "Pinch-Hitter" line. The pump may be carried by hand to any machine requiring use of coolants, the tank filled with coolant and operation started merely by plugging electric cord into an ordinary light socket. Capacity of the pump is 300 gph for water and solubles and 250 gph for light oils. Sturdy and compact, the unit may be used permanently on one machine if desired. Flow of coolant from nozzle is manually controlled by operator from one drop to total capacity. Four multiple nozzles may be used on drill presses, etc.

The baffled, split-lidded tank of 16-gauge welded steel is 16" long, 9" high, and 10" wide and may be cleaned without disturbing return piping. The induction, ball bearing, totally enclosed 110 volt, single phase motor is drip-proof, and dirt-proof and externally fan-cooled, having a heavily guarded cooling fan on shaft extension. The extra heavy, one-piece shaft is attached to an open impeller.

The unit is claimed to be entirely free from troublesome operating defects, small enough for easy portability and large enough for efficient constant use.



WALES—CATALOG "H"

Catalog "H" is announced by Wales-Strippit Corp., North Tonawanda, N. Y. It illustrates and describes the new Wales Type "H" Punching Units which punch holes in flanges, angles, container sides and similar shaped and formed work without making expensive, built-up, single purpose, cam action dies.

Punching holes in side of work instead of on top of a flat surface is made possible by designing these units so the punches move back and forth horizontally rather than up and down.

QUALITY DIAMONDS

FOR DEFENSE

We can supply you with EASTERN Quality Diamonds, known for their dependability, at the following attractive PRICES:



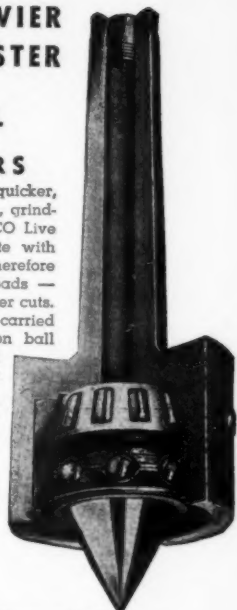
1/4 c't	\$ 2.95
1/2 "	3.95
3/4 "	7.00
1 "	8.95
2 "	15.00
3 "	25.00
4 "	35.00

These Diamonds can be supplied in any special holder or nib at the same price.

TURN HEAVIER LOADS FASTER

with IDEAL LIVE CENTERS

Get more work, quicker, out of lathe, millers, grinders, etc., with ETSCO Live Centers. They rotate with the work, and therefore permit heavier loads — faster speed — deeper cuts. The radial load is carried by a high precision ball bearing and thrust load absorbed by a taper roller bearing. All parts are hardened and ground.



TRIPLE DUTY



Three interchangeable center pieces (illustrated above) for all kinds of centered and uncentered work. Saves set-up time. Extra charge.

Center No.	Morse Taper No.	Cap. 100 r.p.m. Rad. & Thrust	Net Price
1—MA	1	250 lbs.	\$30.00
2—MA	2	250 lbs.	20.00
3—MA	3	250 lbs.	20.00
3—MB	3	400 lbs.	25.00
4—MB	4	400 lbs.	25.00
4—MC	4	600 lbs.	35.00
5—MC	5	600 lbs.	35.00
1 1/2—SC	Straight	600 lbs.	35.00
1 3/4—SC	Straight	600 lbs.	35.00

EASTERN

Tool & Supply Co.

176 GRAND ST., NEW YORK 13, N. Y.

Tools of Distinction

We have in stock a complete line of Milling Cutters, Lathe Tools, H. S. Drills, H. S. & C. S. Taps and Dies, Lathe Chucks, Drill Chucks, Files, Special Taps and Dies.

SEND FOR OUR CATALOGUE

PRUTTON TAPMASTER

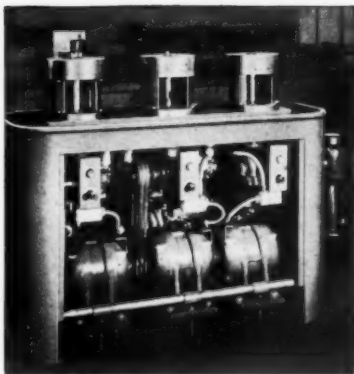
An attractive new bulletin presents the mechanical features of the new 3-spindle automatic tapping machine developed by D. H. Prutton Machinery & Tool Co., 5295 W. 130th St., Cleveland 11, Ohio.

A noteworthy feature of the Tapmaster is its ability to tap three different size holes (up to 1") simultaneously. One, two or three different sizes of work may be handled at the same time. The unit really represents three tapping machines in one.

The Tapmaster employs the lead screw principle. The master nut has a safety feature which prevents excessive vertical pressure on the tap. A keyway in the inside wall of the lead screw fits a key in the spindle. A worm gear rotates the spindle. Positive feed by the lead screw prevents any tearing of thread. The total lead is held within tolerance of .0005". A hole up to 1½" in length can be tapped, with a range in pitch up to 8.

Each unit has its own individual control, being actuated by its own start-stop push button.

There are two tanks of 5-gallon capacity located in each leg. One is for coolant, the other is for hydraulic oil in the event



hydraulic holding is desired. The flow of coolant is shut off when the tap has completed the down stroke.

Length of unit is 60", width 22", height 34". Three a-c motors, each of 2 h.p. capacity are provided. Shipping weight is 2,000 lbs.

Grobet ROTARY FILES

**HAND CUT . . MILLED CUT
GROUND FROM THE SOLID**

There is a Grobet Rotary File, Cutter, Diesinkers Bur in shape, size, and coarseness of cut for every type of hard or soft metal, plastic, wood, etc.

Send for Catalog WR illustrating the complete line in full size, speed charts, etc.

GROBET FILE CO. of AMERICA

421 Canal Street



New York, ¹³N. Y.

IMPORTERS OF GROBET SWISS FILES

MFRS. OF GROBET ROTARY FILES

Here's THE TOOL THAT ELIMINATES A MULTITUDE!

THE
**Mohawk
SUBLAND**

PERFORMS SEVERAL OPERATIONS WITH ONLY ONE SET-UP

In producing parts with step cavities that ordinarily require several tools and several operations, such as drilling, reaming, countersinking and chamfering, the whole job can now be done with a single tool and a single set-up, giving one-tool control of your multi-step cavities. Take for example the Mohawk Subland illustrated at the left. This particular design, a three-step Subland, will bottom, chamfer and face at the same time.

Made to blueprint specifications in two, three or four steps, as required, Mohawk Sublands embrace a variety of combinations, such as the following:

A Subland that will drill and counterbore at the same time.

A Subland that will drill, counterbore and spot-face, without change of set-up.

A Subland that will drill and ream a hole in one operation.

A Subland that will drill, ream and counterbore with a single machine setting.

Mohawk Sublands, by reducing set-up time, greatly reduce production costs. Also, by insuring perfect concentricity of holes, they practically eliminate spoilage losses. Extremely long life because all lands are circular ground and of uniform diameter right up to the shank.

Delivery — 3 to 5 weeks.



Minimum
size
.200
Maximum
size
3 1/2" on
small step

Patents
Pending
on all
Mohawk
Sublands



Write for
Bulletin 40

Mohawk

TOOL COMPANY

21647 DEQUINDRE ROAD

HAZEL PARK, MICHIGAN

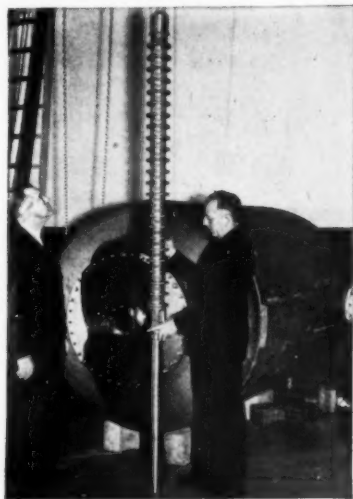
POWER CIRCUIT TRANSFORMERS

Power Circuit Transformers made by Jefferson Electric Co., Bellwood, Ill., in capacities from 100 to 750 watts are now available with simple, effective circuit breaker for overload and short-circuit



protection. Transformers of these capacities are used extensively, mounted directly on machines to step down the 550, 440, or 220 volts to 110 volts for various electrical appliances and localized lights. This type of transformer in connection with remote control station meets electrical safety standards of the National Machine Tool Builders Ass'n. Flexible cable or conduit may be run from wiring compartment to motor or appliance. Transformers can be furnished with "on" and "off" switch and receptacle in wiring compartment, a feature that is desirable when serving small wattage appliances or individual lamps. Circuit breaker is tamper-proof being completely housed in

the transformer case with the reset button extending as shown. For 25 to 75 watt transformers with their light loads, glass enclosed fuses are provided in place of circuit breakers.



Dr. Ernest E. Charlton (left) head of the X-ray section of the General Electric Research Laboratory, and Harry Mesick, examine the nine-foot sealed-off 2,000,000-volt multisection X-ray tube. In use, this tube is in the axis of the tank in the background, with the lower section projecting thru the opening. Electrons, starting from an electron gun at the top of the tube, receive an 83,500-volt push in each of the 24 sections, so that they have energies totalling two-million volts as they hit the target at the bottom of the tube and generate X-rays.



McMAHON'S Magnetic Blocks

V-100 Magnetic Block

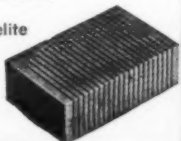
30-45-60° Angle, with Brass Separators, Brazed in place. Size $2\frac{1}{2}$ " x $2\frac{1}{2}$ " x $3\frac{1}{2}$ " long. Priced \$35.00 each.

K-125 Magnetic Parallels

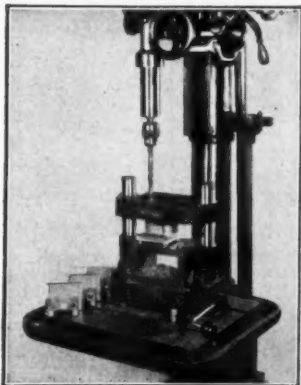
Sold in Sets of Two Blocks, with Bakelite Separators. Size, $1\text{-}3/32$ " x $2\frac{1}{4}$ " x 4" long. Price, \$12.00 per Set.

Write for Descriptive Literature.

FRANK McMAHON COMPANY
142 S. JUNE ST. DAYTON 3, OHIO



WOULD YOU LIKE TO SPEED UP DRILLING OF SMALL PARTS?



GET AN "ESCO" DRILL JIG!



Because of the remarkable ease and speed with which it can be loaded and unloaded, the Esco Drill Jig tremendously increases the production rate in drilling, reaming and boring operations.

By reducing loading and unloading time to a matter of a few seconds, it saves enough

man-hours in the course of a quantity production job to repay its cost many times over.

Extensively used in place of special jigs and fixtures, making it possible to get production under way in much shorter time. Made in a wide range of models and sizes. Write for literature.

Immediate Delivery

ESCO ENGINEERING CORP.

5987 Woodward

Write for
LITERATURE

Detroit 2, Mich.

ALL-ALUMINUM TOGGLE CLAMP

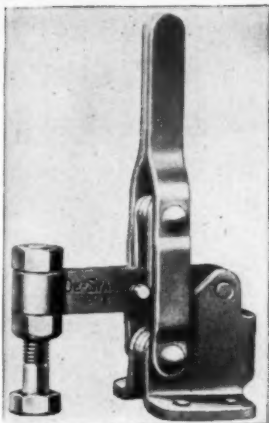
A new light-duty all-aluminum toggle action clamp is announced by the Detroit Stamping Co., 347 Midland Ave., Detroit 3, Mich. According to Harry Robeson, national sales director, finished parts division, this clamp was especially developed for use on portable or spot welding fixtures but should prove equally interesting wherever space limitations or weight of clamp is a factor.

New Nesting Type Tote Pans



20" long x 12" wide x 6½" deep.
16 ga., drag holes and handles both ends.

J. L. LUCAS & SON, INC.
BRIDGEPORT, CONN.



This new clamp will be known as "De-Sta-Co Model 202-A Toggle Clamp". Made of pressed metal (aluminum) parts. Weighs less than 3 ounces, including steel hold-down spindle and adjustment nuts. Measures 2½" long, 1½" wide at base, and 3¼" high when in locked position.

Cut Clamping Time

50%—OR MORE!



Cardinal **SPEED VISE**
Opens and closes full range instantly. Locks and unlocks with half-turn.

Cardinal Automatic **AIR VISE**
Synchronizes vise opening and closing with machine tool cycle—completely automatic.

WRITE FOR BULLETIN 8

CARDINAL MACHINE COMPANY

CHICAGO

CALIFORNIA

SPEEDING BRAZING JOBS

The current issue of Low Temperature Brazing News, No. 21 covers a subject of vital interest to thousands of plants that are now using silver brazing alloys. It points out how the preplacement of Sil-Fos and Easy-Flo can save time and money by simplifying and speeding up brazing operations.

Copies of the issue are available from Handy & Harman, 82 Fulton St., New York 7, N. Y.

DIAMOND ACME TOOLS

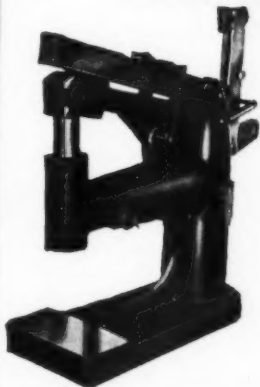
Diamonds vary in quality and it is important to use the proper kind for a given job.
"Bargain diamonds" are not an economy.

If you don't know diamonds know your diamond dealer.
Our 45 years in this field merits your confidence.

ACME DIAMOND TOOL CO.

15 MAIDEN LANE, NEW YORK, N. Y.

AUTOMATIC STAKING MACHINE INCREASES PRODUCTION With Unskilled Manpower!



Outperforms conventional Riveters on numerous jobs.

A shortage of skilled workers won't upset your staking machine production if you use the Automatic Staking Machine which, even in unskilled hands, is fast, accurate and thoroughly dependable.

Uniform blow of hammer makes it ideal for riveting movable joints; can be quickly and easily adjusted for various jobs.

Available in Three Sizes

Stroke	1	1-B	2
Spindle	2"	2"	2 1/2"
Throat Depth	1"	1"	1 1/4"
	4 3/4"	4 3/4"	8 1/2"

Now's the Time to Write for Descriptive Material
and Prices.

WEBER MACHINE CORP.

59 Rutter Street

Rochester 6, New York

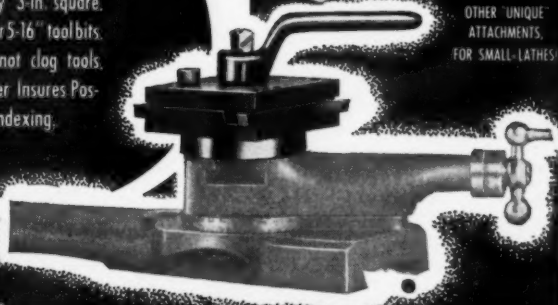
Use **UNIQUE**

TOOL POST TURRET TOOL HOLDER

For 9-inch South Bend, Atlas,
Clausing or Logan Lathes.

- 4 Separate tool positions.
- Tool body 3-in. square.
- Uses 1-4 or 5-16" toolbits.
- Chips cannot clog tools.
- Pin Locator Insures Positive Indexing.

OTHER "UNIQUE"
ATTACHMENTS
FOR SMALL LATHES



Ask Your Dealer
or Write Direct To

**UNIQUE MANUFACTURING
COMPANY**

4807 N. 31st AVE. OMAHA 11, NEBR.



AIR-BLITZES dust, chips, filings from machinery, tools, parts. Cleans hard-to-get-at places. Snappy trigger action. Easy-grip handle. Leak proof valve. Strainer-screen at air inlet. Sturdy construction; practically no maintenance cost. Try one; you'll order more! Assortment of nozzles and extensions.

**PROMPT
DELIVERY**

PAASCHE AIRBRUSH CO.

1952 Diversey Parkway, Chicago 14, Illinois
Paasche Airbrush (Can.) Ltd., 110 Elm St., Toronto

TOOL-FLEX HOLDER

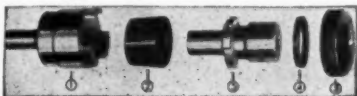
A new type flexible tool holder, "Tool-Flex", is announced by the Burg Tool Mfg. Co., 535 North Detroit St., Los Angeles 36, Cal.

Tool-Flex utilizes a simple, inexpensive, oil-resistant Neoprene rubber insert as the "universal joint" in which tool floats. This construction is the essence of simplicity, as shown in the exploded view of the Turret Lathe Model with Straight Shank, which consists of only five parts, i.e.:— (1) Body or shank; (2) rubber insert; (3) holder; (4) rubber grommet; (5) retainer cap. Other Tool-Flex types dispense with the grommet, have only four parts.

Tool-Flex is designed expressly as a follow-up tool. It compensates for both parallel and angular misalignment of turret head or tail stock with the lathe spindle. The makers emphasize that it permits reamer, counterbore or hone to follow and, by relieving side pressure, prevents bell-mouthing, oversize holes and tool marks; reduces wear on tool and jig bushings; produces more accurate close tolerance work. The Neoprene insert, by absorbing shocks in such operations as tapping and portable tool drilling, reduces tool breakage. Vibration in jigs is

practically eliminated. Flexibility is perfectly balanced, so that the concentricity of the entire tool is maintained for precision work. Flexibility is readily adjustable; tightening or loosening the retainer cap increases or decreases the counteraction of the insert to compensate for varying degrees of misalignment or character of work.

When used with portable drills, Tool-Flex is specially valuable in fast production operations in that it prevents binding and compensates for the invariably incorrect position of the tool as held in the hand; and because it cushions the shock on the drill caused by reflex action of operator when drill breaks thru.



Tool-Flex flexible tool holders are made for both large and small lathes with turret heads, engine lathes, drill presses, tapers, and $\frac{1}{4}$ and $\frac{1}{2}$ " portable drills. Chuck arbors, reamer holders and Morse taper sleeves are interchangeable in any style body of the same size. All metal parts are made of alloy steel, hardened and ground where needed.

Tool-Flex flexible tool holders are available with straight shanks $\frac{1}{2}$ to 2", female taper 2-A or 33 for drill press spindles, and Morse taper shanks sizes Nos. 2, 3 and 4.

DURABONDED COATED ABRASIVES

Behr-Manning, a division of Norton Co., have brought forth another improvement in coated abrasives—known as Durabonded—a treatment which hardens the adhesive and makes it more resistant to heat and less sensitive to humidity.

Reports on Durabonded products from the metal working industry show an average of 20% longer life on fast-running belts, fibre combination discs and the many ingenious cloth "gadgets", all of which are standard tools in this field. There is no price increase. Durabonded products are said to be as great a step forward as were Behr-Manning's two other developments—Openkote, wide separation among the cutting crystals; and Lightning, their electroplating process which stands the cutting grains on end, equally spaced by means of a powerful electrostatic field.

Any readers who have not yet tried Durabonded coated abrasives on their metal sanding operations, have only to write to Behr-Manning, Troy, N. Y., for an immediate opportunity to do so.

Automatic Production Counting

Never before has time and energy saving effected by automatic counting been so vital to production efficiency.

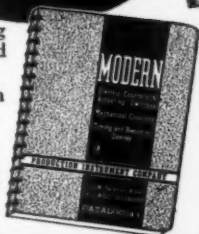
That is why the outstanding dependability and adaptability of our Mechanical, Electric, and Predetermined Electric Counters are so important. Whether it's coil winding at 10,000 turns a minute, counting punch press production, or remote counting of varied operations all over the plant, we have service-proved instruments for the job.

Experience acquired in years of specialization is available in selection and application. Just tell us what you want to do.

Production Instrument Company

704-14 W. JACKSON BLVD. CHICAGO 6, ILL.

Manufacturers of Counting, Timing and Recording Devices



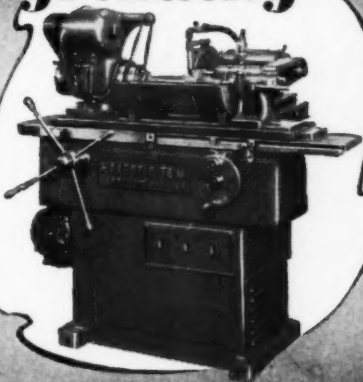
simplified grinding

with **PARKER-MAJESTIC**
Internal and External
Grinders

For precision grinding . . . internal or external . . . Majestic simplicity of design and flexibility of changeover guarantee maximum grinding output at low cost.

Send for descriptive circular..NOW!

Representatives in all principal cities



MAJESTIC TOOL & MFG. CO.

2950 EAST WOODBRIDGE

DETROIT 7, MICHIGAN

ARO IMPACT WRENCH

A new $\frac{1}{4}$ " impact wrench has been added to their line of pneumatic impact tools, by The Aro Equipment Corp., Bryan, Ohio.

Operating with controlled torque, this tool is designed to eliminate stretching or



"burning" of threads in setting nuts, bolts or Phillips screws. It is capable of both forward and reverse rotation and has a calibrated adjusting screw on side of motor that enables operator to set any bolt, nut or screw to any desired tension.

Torque control is obtained thru roller clutch impacting mechanism, consisting of but four parts. It is a combination of the construction of impact mechanism, plus flow of air thru tool that enables operator to set the bolt, nut or screw to any desired torque.

Model 106 is particularly applicable for use in driving Phillips, Reed and Prince or Allen head screws. Action of impact mechanism is such that while it drives screws to desired tightness, it will not tear head of screws or break the bits.

Capacity of tool is up to $\frac{1}{4}$ " bolt size; overall length, $7\frac{1}{8}$ "; spindle offset, $1\frac{1}{32}$ "; square drive, $\frac{3}{8}$ "; weight $2\frac{1}{8}$ lbs. It comes complete with one socket and $8\text{--}5/16$ " hose and fittings.

BROACH SHARPENER BULLETIN

An eight-page illustrated bulletin (No. CS2-44) describing its new broach sharpeners has been issued by Colonial Broach Co., Box 37—Harper Station, Detroit 13. These sharpeners (Models CS2-72 and CS2-84) have been designed for sharpening round and flat broaches; spline and serrated types; etc., from the smallest size up to broaches 7 feet long and having a maximum diameter of 6" (8" maximum width for flat broaches). By providing a rapid and accurate means for maintaining original tooth form and cutting effectiveness in broaches, this machine makes it possible for shops to do their own broach sharpening, thereby eliminating time lost in returning broaches to manufacturers for this operation.

Among features of the new model described is the lightweight alloy sliding head which—mounted on full anti-friction double-row rollers—provides surprising ease of sharpener operation. A feature available at slightly extra cost is Colonial's dual-ratio micrometer hand wheels with which feed can be controlled to the ten-thousandth of an inch. Also available at slight added cost is a special roller curtain for protecting ways of machine when table is moved to one side or another.

Booklet contains descriptions of cylindrical and flat broach sharpening operations; the machine's lubrication system, electrical controls, etc.; and complete general specifications for the two sharpeners together with lists of standard and extra equipment offered.

Real Cleaning Power One-Man Portability with TORNADO

Portable Industrial Vacuum Cleaner



QUICKLY picks up chips, dust or water. Cleans walls, beams, machines, floors, boiler tubes and tops, molds, etc. Powerful - portable. A real one-man unit. Weighs only 40 lbs. Dirt capacity 12 gals.

Write for details and
FREE TRIAL OFFER



**BREUER
Electric Mfg. Co.**

5118 N. Ravenswood Ave., Chicago 40, Ill.



MEASURING A PLUG GAGE with LIGHT WAVES using an optical flat, a toolmakers flat and a gage block

The formula is:

$$D = h + (.000012 \times N \times \frac{W}{W})$$

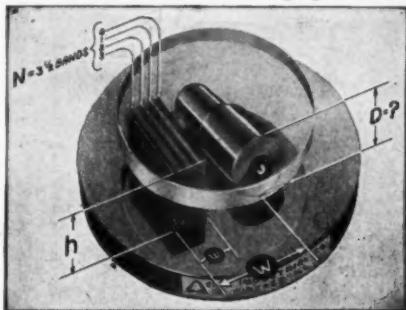
Substitute the actual values

$$D = .750 + (.000012 \times 3\frac{1}{2} \times \frac{1\frac{7}{16}}{23/64})$$

and get the answer

$$D = .750168 \text{ inch.}$$

It's just that simple!

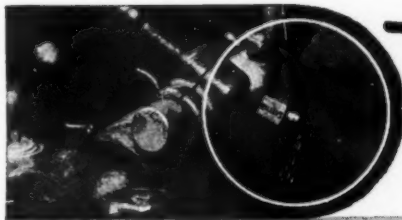


Write for new, free *Lightwave Measurement Booklet.*



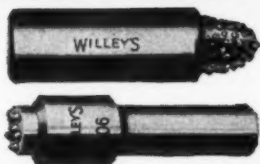
ACME INDUSTRIAL CO.

Makers of Standardized Jig and Fixture Bushings
210 N. Laflin St. MONroe 4122 Chicago 7, Ill.



WILLEY'S DIAMOND TOOLS

Complete lines of diamond cutting tools and diamond and mechanical wheel dressers. Ask for catalog 41.



WILLEY'S TUNGSTEN CARBIDE TOOLS

Standard cutting tools, blanks, and special tools, gages, centers, centerless grinder rests, using WILLEY'S METAL. Fully described in big new catalog 27. Write today.

WILLEY'S CARBIDE TOOL CO.

SOLE DISTRIBUTORS OF WILLEY'S METAL

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Detroit 1, Michigan

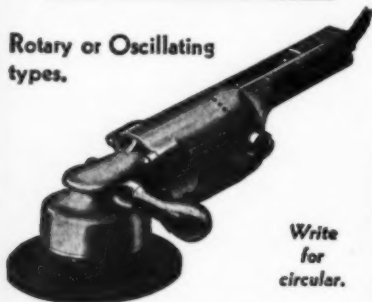
NEDCO

Electric

SANDING—RUBBING MACHINES

SOLVE YOUR SURFACING PROBLEM

Rotary or Oscillating
types.



Write
for
circular.

THE NEDCO COMPANY

WALTHAM

2-1

MASS.



RED HEAD

ETCHERS and DEMAGNETIZERS

Let us tell you the many advantages of our new D. C. and A. C. models now available. Also, see our new line of Midget Chucks.

Send **TODAY** for latest circulars

PRINTZ ELECTRIC CO.

7742 FENKELL AVE.,

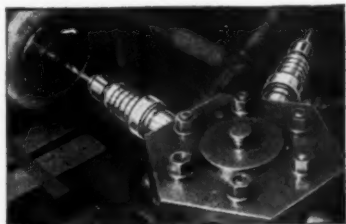
DETROIT 21,

MICHIGAN

KELLER SCREW MACHINE DRILLS

A new line of air drills, designed for use on hand and automatic screw machines is announced by Keller Tool Co., Grand Haven, Mich.

These drills may be mounted in regular tool holders of automatic or hand screw machines. Compressed air is fed to the drill thru a valve arrangement which opens as the turret moves forward and closes immediately when turret is backed away from work.



It is claimed that these pneumatic drills have two distinct production advantages in driving standard twist drills, in comparison with twist drills held stationary:

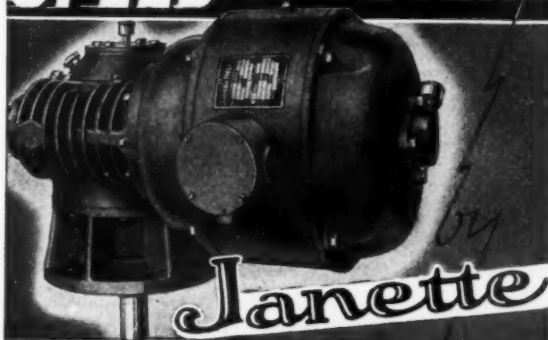
First, drilling speed with Keller pneumatic screw machine drills may be increased by 1200 to 3500 rpm. The entire time cycle of parts manufacture that was formerly held up by the drilling operation, is thereby improved. This is of utmost advantage when drilling small, deep holes on the larger types of screw machines, where spindle speed is much too slow to produce a satisfactory cutting speed.

Second, holes drilled by this method will not "run out" as air drill spindle revolves in a direction opposite to direction of work in the screw machine spindle. This results in a true hole and eliminates drill breakage.

The new screw machine drills are available in three sizes and eight models, having speeds of 1200, 2800, and 3500 rpm. Drill capacities range from 1/32" to 3/8" diameter twist drills. All tools are powered by the Keller standard rotary vane type pneumatic motors.

The application illustrated is of two drills. Model 1494H, mounted on the turret of a hand screw machine. Each of the two drills operates only while engaged with the work.

SPEED REDUCERS



For SLOW SPEED DRIVES

Speed reducers provide a practical, economical, quiet, efficient, compact, low maintenance cost method for obtaining positive slow speeds from high speed motors.

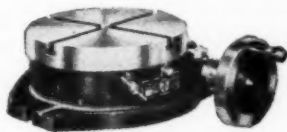
Janette reducers are built in either motorized or motorless styles, with foot or flange mountings, and can be furnished with Janette ventilated or enclosed motors, designed for standard and special applications.

WRITE TODAY for your copy of our catalog—**100 pages** of complete information on **47 speed reducers**, 1/50 to 10 H.P.

Janette Manufacturing Company
556-558 W. Monroe St. Chicago, Ill.

BRAND NEW PRECISION

ROTARY TABLES



9"	— \$ 97.00
12"	— 160.00
15"	— 185.00
18"	— 220.00
18"	— 350.00 Extra Heavy Duty

OUR ROTARY TABLE WILL TAKE THE PLACE OF A COSTLY FIXTURE. IT IS USED FOR ALL KINDS OF WORK ON MILLING MACHINES, SHAPERS, DRILL PRESSES AND HORIZONTAL BORING MILLS.

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FAST DELIVERY GUARANTEED.

Send for Literature of other tools.

LAFAYETTE TOOL & SUPPLY CO.

128 LAFAYETTE ST.

NEW YORK, N. Y.

ELECTRONIC IDENTOMETER

Electronic timing control on the new Identometer is said to eliminate the human factor in timing tests for positive identification of rolled or forged ferrous alloys and speeds up work to a point where it's possible to keep pace with assembly line speeds



Its function is to identify rolled or ferrous alloy for stocking or processing. This is accomplished by providing a known sample against which the un-

known pieces are checked quickly by the instrument.

Identometer utilizes the principle of thermoelectricity. All metals and alloys, except pure lead, exhibit thermoelectric effects to varying degrees. When two metals or alloys are brought in contact with each other and the point of contact is heated, there will be a small current generated, magnitude of which will depend upon the difference in materials and temperature to which contact is heated. If the two materials are identical, there will be no current generated.

By placing two samples in contact and heating the contact by passing a current thru the pieces, the thermoelectric current generated can be measured. This is the principle of operation of the Identometer.

Identometer is manufactured by American Tubular Elevator Co., Instrument Division and is distributed by Dravo Corp., 300 Penn Ave., Pittsburgh 22, Pa.

GAUGE LUBRICANT

It is reported that users of CMD Center Point Lubricants are using this material with success for lubricating various gauge surfaces. Not only does this lubricant reduce wear, but it is claimed to also reduce inspection time. It prevents sticking of plug, ring, snap or thread gauges. It is pointed out that this lubricant will not corrode the finest of surfaces; therefore, it can be used as a rust preventive over the entire gauge and protects gauges from corrosion caused by body acids from operator's hands. It is claimed a wiping film of oil will last from one to two hours on any size gauge. The same procedure is followed when storing gauges.

The manufacturer, Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill. is prepared to send samples and information on gauge lubricants.

Grobet

SWISS FILES

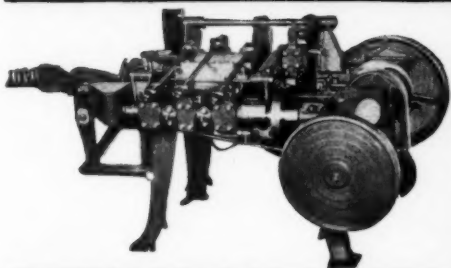


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FOR EVERY PURPOSE**

Genuine Grobet Precision Swiss Files are world famous for utmost precision and durability since 1812. Learn more about these chrome steel files — send for Catalog WS, the most complete of its kind.

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TO MEET TODAY'S INDUSTRIAL REQUIREMENTS



THE NILSON AUTOMATIC METAL AND WIRE FORMING MACHINE

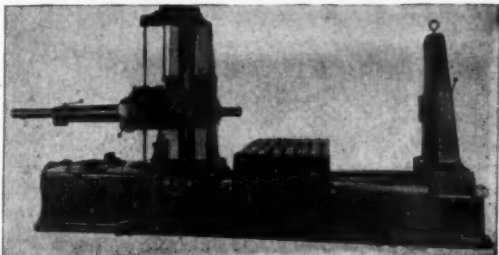
The Nilson Automatic Metal and Wire Forming Machine meets today's industrial requirements. Here are some of the features of this machine: Open construction of press and forming tools. Patented slide feed with an independent cam-operated wire gripping device. Power operating wire feed is transmitted through a straight line.

Write today for information

The **A. H. NILSON** *Machine Co.*
BRIDGEPORT, CONN., U.S.A.

P O R T A G E No. 4

HORIZONTAL BORING, DRILLING & MILLING MACHINE



● Designed and built to meet the need for speed and accuracy demanded of today's production.

WRITE TODAY

for fully illustrated bulletin giving detailed description of the many features of this Horizontal Boring, Drilling and Milling Machine. No obligation.

THE PORTAGE MACHINE CO.
AKRON 11, OHIO

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Mill keyways in the run or on the ends of shafting already erected—save money on alteration, erection, and repair work.

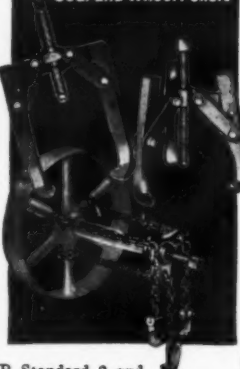
Made in 4 sizes, for hand or motor operation.

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ARMSTRONG-BRAY Gear and Wheel Pullers



Write for Catalog Sheets showing

STEELGRIP Standard 2 and 3 arm Wheel Pullers, special Battery Terminal, Pitman Arm, Fan Pullers and CHAINGRIP Universal Pullers.

ARMSTRONG-BRAY & CO.

"The Belt Lacing People"

3364 Northwest Highway Chicago 30, U.S.A.

WALES-STRIPPIT CATALOG

The new technique of hole punching, known as the Wales "CD" Hole Punching System is illustrated and described in the latest catalog CD, issued by Wales-Strippit Corp., North Tonawanda, N. Y. This system is made up of their hole punching units, templates, locator rings, adjustable stops, feed rails and drill templates.

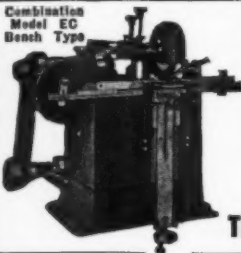
The company emphasizes that with these parts, making a perforating die is a simple assembly job which provides many new, time-saving and money-saving advantages.

The two methods of mounting type "CD" units into a multiple hole punching die are described and illustrated, together with their many applications in press brakes and stamping presses. Conveniently arranged index permits quick location of desired information, and the booklet contains many timely facts and helpful hints.

SILENT STOCK TUBE

The Corlett-Turner Co., 4011 W. Lake St., Chicago 24, announce the C-T Silent Stock Tubes for use with automatic screw machines. These tubes which replace ordinary stock tubes, are engineered acoustically, so that they eliminate the banging and clattering of bar stock, revolving at high speed in the machine. It is claimed that in closely packed screw machine departments, even when machining hexagonal, square or other "noisy" bars, it is possible to carry on a conversation in a normal voice, where these "silent" stock tubes are used. It is also claimed that such installations have greatly decreased absenteeism of operators, especially among the women, and decreased spoilage, because operators are able to "listen" to their machines. C-T Silent Stock Tubes can be readily installed on most standard stock stands.

Combination
Model EC
Bench Type



SHARPEN YOUR OWN SAWS

SAVE OVER 80% ON SHARPENING HACK, BAND, CIRCULAR SAWS

The WARDWELL SAV-A-SAW automatically sharpens saws with teeth as fine as 32 to the inch at a speed up to 75 per minute. Savings on 2 gross of blades will pay for the machine. Assures keener cutting saws at extremely low cost.

Write for complete information

The Wardwell Mfg. Co. 3165 Fulton Rd., Cleveland, O.

Accurately holds the depth at the same time it automatically centers parts for drilling, milling, tapping, etc. Needed in every plant where second operation work is done. Also for assembly or wherever a holding fixture to do precision operations is needed. Uses Brown and Sharpe type screw machine collets and simplifies "setting-up" operations and in most instances eliminates the making of jigs or fixtures.

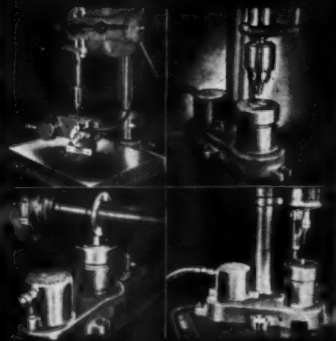
Has low consumption of air and its simplicity of construction eliminates expensive repairs.

Four models—No. 00—No. 0—No. 2 and No. 2 Special. Collet capacity from 1/16" to 1 3/4".

Literature on request.
Write for Catalog Sheet.



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AIR CHUCK



REDMER AIR DEVICES CORP.
608 W. WASHINGTON BLVD., CHICAGO 6, ILL.

**RUGGED!
ACCURATE!**

4 sizes
72"
90"
110"
134"



**ROGERS
"NT"
KNIFE
GRINDER**

**GRIND YOUR
OWN KNIVES
and SHEAR BLADES**
Save time and speed
production!

This late model, cabinet-base Rogers Grinder grinds knives so they cut more keenly and last longer. Grinds on edge or face . . . any bevel . . . edge up or down . . . flat or concave. No skilled operator needed. Send for Circular N T; give length of knives.

SAMUEL C. ROGERS & CO.
207 Dutton Ave.
Buffalo 11, N. Y.

Also manufacturers of circular knife and band saw sharpening equipment.

ROGERS KNIFE GRINDERS
PRECISION QUALITY SINCE 1887

LEVER-LOCK BORING BAR

Recently announced by the Robert H. Clark Co., 9330 Santa Monica Blvd., Beverly Hills, Cal., is a Precision Lever-Lock Boring Bar. According to the manufacturer, these Boring Bars provide many unusual features and answer a long-felt need for a bar with separate tool bits for small diameter holes.

Presented as a companion tool to the Adjustable Tool Holder, these Boring Bars are available in sets of four . . . 3/16x5, 1/4x6, 5/16x7 and 1/2x8".

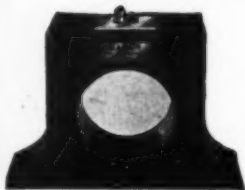
Boring bars with separate cutters in sizes below 3/4" have not before been generally available, yet these are designed for use without bushings or adaptors. They require no special clamps or holders. The parallel type Clark Adjustable Tool Holders hold them securely, and together they are claimed to make a practical combination.

Manufacturers of tungsten carbide tool bits now supply solid round carbide bits in small sizes down to 3/32" diameter for use in the Boring Bar. The evenly distributed pressure of the lever-lock clamp



prevents breakage which frequently occurs when pressure is applied only at one point by means of a set-screw.

One precision ground high speed threading bit and one boring bit are provided, ready for use with each Boring Bar. Lever-lock holds tool bit at a right angle on one end and at a 15° angle on opposite end. Replacement cutters are readily made from round carbon, or high speed steel drill rod. Thus, use of expensive solid forged bars is eliminated.



Model 10

SPECIFICATIONS

Size Overall: 12" High, 17" Long,
4 1/2" Wide.
Bore Clearance: 7" Circular.
Weight: 21 lbs.
Shipping Weight: 25 lbs.
Voltage: 105-120 Volts, 50-60 Cycles.
Fuse 5 amperes or 210-240 Volts,
50-60 Cycles. Fuse 2.5 amperes.
Specify which voltage is required.
May be wound for special voltages
to order, prices on request.

THE MAG-NO INDUSTRIAL DEMAGNETIZER

IMPROVED SOLENOID TYPE

The MAG-NO DEMAGNETIZER has many advantages over surface types since no contact with the tool is required. Eliminates scratching and greatly facilitates demagnetizing on a mass production scale. The MAG-NO cannot be damaged by accidental use of incorrect voltage as it is equipped with a fuse type of cord plug. Fits any standard A.C. receptacle. Any capacity, size or shape may be made to suit your special needs.

Write for descriptive circular

DAKON TOOL & MACHINE CO.
838 BROADWAY
NEW YORK 3, N. Y.



**NO BUCKING
-NO BREAKING**

DO YOU WANT

MORE WORK out of your present band saw equipment?

GREATER PROTECTION to workers?

REDUCTION of blade breakage?

ALL KINDS OF MATERIALS cut?

THEN install immediately **PADDOCK BALL-BEARING BAND SAW GUIDES**. Interchangeable ball-bearing wheels running with the blade give proper support to the blade and increases the efficiency of any machine. **ORDER ONE OR MORE TODAY ON 10 DAY FREE TRIAL.** Or write for prices and circular.

PADDOCK TOOL COMPANY

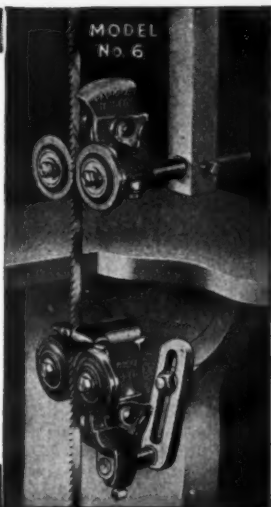
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Get More Production
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Specify the Turret with
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- ★ Sturdy Construction

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19

**A Set of Nicholson
E-X-P-A-N-D-I-N-G
MANDRELS
209 does the work of
Solid Arbors**

NICHOLSON EXPANDING MANDRELS handle all bores from $\frac{1}{2}$ " to 7", representing remarkable savings in money, as well as in man and machine hours. Hardened tool steel, accurately ground. Two types, all sizes; sold singly or in sets, Prompt delivery. Bulletin 1043.



TYPE A—STEP JAW DESIGN

Especially adapted for holding work with short bores while being machined between centers on lathes, grinders, millers, shapers, etc.

Size No.	Range of Bores Taken	Length Overall
1A	$\frac{1}{2}$ " to 1"	3"
2A	1" to $1\frac{1}{2}$ "	11"
3A	$1\frac{1}{2}$ " to 2"	12 $\frac{1}{2}$ "
4A	2" to 3"	20 $\frac{1}{2}$ "
5A	3" to 4"	21"



TYPE B—STRAIGHT JAW DESIGN

Adapted for work with both short and long bores.

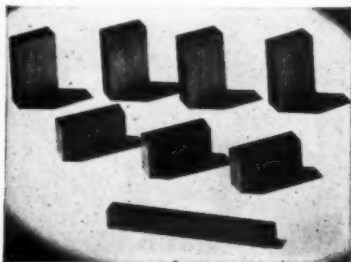
Size No.	Range of Bores Taken	Length Overall
1X	$\frac{1}{2}$ " to $\frac{3}{4}$ "	5"
2X	$\frac{3}{4}$ " to 21/32"	6"
3X	21/32" to $\frac{3}{4}$ "	6"
00	$\frac{3}{4}$ " to $\frac{7}{8}$ "	8 $\frac{1}{4}$ "
0	$\frac{7}{8}$ " to 1"	9"
1	1" to 1 $\frac{1}{8}$ "	11 $\frac{3}{4}$ "
2	1 $\frac{1}{8}$ " to 2"	13 $\frac{3}{4}$ "
3	2" to 2 $\frac{1}{2}$ "	17 $\frac{1}{4}$ "

(Other sizes taking up to 7" bores.)

W. H. NICHOLSON & CO.
117 Oregon St., Wilkes-Barre, Pa.

HARDSTEEL TOOL TIPS

Black Drill Co., Division of Black Industries, 1400 E. 22nd St., Cleveland 17, Ohio, is now supplying in addition to tool bits, a line of tool tips made of Hardsteel and designed for brazing into steel shanks. These tool tips are made of the same metal used in the well known Hardsteel drills so widely used for the drilling, without previous annealing, of steels hardened by any method.



Tools tipped with Hardsteel are said to possess several advantages. They are more economical in first cost. They are more easily and quickly reground on a standard wheel one or two grades softer than is necessary for high speed steel. They are easy to braze. They permit the making of tools that combine a strong tough shank with a cutting edge having abrasion resisting qualities of the sintered carbides plus shock resisting qualities of high speed steel. They are said to be ideal for machining the harder and tougher steels and the abrasive copper and light metal alloys, either rolled or cast. They hold cutting edges over long periods of use at higher cutting speeds and thus save down-time.

Hardsteel Tool Bits are made in all standard sizes and are available from stock. Special sizes for unusual applications can be supplied.

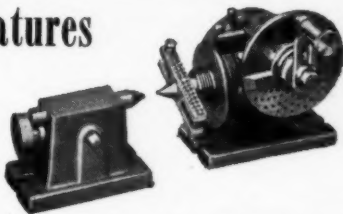
GEAR CATALOG

Users and buyers of gears of all kinds will find in the 64-page catalog, issued by the Illinois Gear & Machine Co., 2108 N. Natchez Ave., Chicago 35, a valuable compendium of gear information. Not only does it describe and list some of the representative gears they manufacture, but technical information for ordering gears correctly, symbols used in designating gear parts, formulae for computing the hp of various gears, factors for determining the strength of gear teeth and many other handy calculations.

Proven Precision Features of the NEW ELLIS DIVIDING HEAD

WITH the capacity of a 6½ in. to 11 in. swing with riser blocks, crank indexing or direct indexing, and positive elimination of spindle backlash, the *Ellis* is a accurate machine tool having an unusually wide range of shop adaptability. It is ruggedly built of the best materials.

You can change from 40:1 ratio to quick indexing or vice versa in 30 seconds. Instantaneous free-wheeling without dismantling. Write today for illustrated folder No. 3!



Shown with Standard Base and Tail Stock

Complete equipment with each head includes:

Swivel and standard bases—2 riser blocks—center with driver arm—3 index plates—hold down bolts—tail stock.

A leader in the moderate price field

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Roto Center

PAT.
PENDING



Exclusive Features

- ★ Two matched Timken roller bearings.
- ★ Preloaded for Rigidity
- ★ Point Ground After Assembly for Maximum Accuracy
- ★ Heavy Duty Bearing Seal
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HEAVIER CUTS — HIGHER SPEEDS — MORE PRODUCTION

*Morse tapers in stock — specials of all kinds.
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Each \$1.75

Complete handbooks
and training manuals by
a master toolmaker

for reference
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Containing clear, detailed directions, with illustrations, for each operation performed on lathes and milling machines, together with all necessary technical information and "tricks of the trade".

Prepared by a master toolmaker who has been supervising training for war workers in Detroit, and expertly organized for maximum ease and efficiency in learning or in teaching others.

Other manuals by King, which are now in preparation, will cover Bench, Shaper and Grinder Operations.

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PUTNAM TOOL CATALOG

An attractive and interesting new catalog features the complete line of Putnam metal cutting tools.

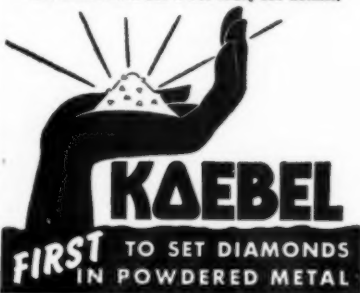
This Catalog, No. 44, comprises 92 pages and cover and illustrates in two colors the full line of Putnam End Mills, Chucking Reamers, Continuous Pilot Counterbores. Holders, and other products—listing with full specifications, prices, etc., all of the 1023 items now in the Putnam line. Additional sections are devoted to special purpose tools and engineering data invaluable to cutting tool users.

The cover—sturdily bound to give long service—is of light blue textile leather, with die stamping of the Putnam title and trademark in silver and contrasting dark blue foils. An inside pocket of the slip cover holds the body of the book which is spiral bound to permit the pages to lie flat wherever opened. An interesting feature of the catalog is its unusual index which is illustrated and carries the title, "Pictorial Tool Selector."

A copy will be sent those who request it on company letterhead, without charge or obligation. Address Putnam Tool Co., 2983 Charlevoix Ave., Detroit 7, Mich.

Diamond Tool COST CONTROL

The Koebel Library of Conservation Information is available to help reduce the ultimate cost of your diamonds. Practical employee training literature on how to use diamond tools. Write today for details.



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Presenting
**A SUPER
 DIAMOND WHEEL**
**CUTS MUCH FASTER — LASTS
 MUCH LONGER**

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 New
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 MODEL "B"**

**CHUCKING
 and INDEXING
 FIXTURE**

FOR USE ON MILLING MACHINES

The Dearborn Fixture meets the demand for automatic chucking and indexing, permitting several operations on the same piece with only one setting. Its simplicity of design, high precision, milling accuracy and speed of operation has led to its adoption by many of the leading manufacturers thru-out the country.



Work held by automatically opening and closing collets
 Work automatically ejected
 Indexes without loss of time
 for milling 1, 2, 3, 4, 6, 8, 12
 or 24 sided pieces

**Write for
 Folder**

J. W. DEARBORN

**ANSONIA,
 CONN., U. S. A.**



FAIRFIELD GEAR CATALOG

A 16-page, well illustrated catalog showing the company's facilities for manufacturing gears to order has been produced by the Fairfield Mfg. Co., Lafayette, Ind. The catalog illustrates and briefly describes 27 different Fairfield gears and gear sets. It includes spiral bevel gears

and pinions, worms and worm wheels, Zerold gears and pinions, spur gears, herringbone gears, straight bevel gears and pinions, helical gears, splined shafts and complete differentials.

Other illustrations show factory and laboratory facilities. Copies are available on request.

In turning out almost incredible numbers of planes for war—such as these (A-20's) shown speeding towards completion on the Douglas assembly line—West Coast industry has demonstrated what modern tools, combined with engineering skill and production know-how, can accomplish. Use of such materials as Carboloy Cemented Carbide, has enabled the machining of vital parts at production rates, in many cases 8 to 10 times greater than was possible with former practice. (Courtesy—Douglas Aircraft Co., Inc.)

PALMGREN

ANGLE—DRILL PRESS—PRODUCTION VISES



No. 000

ANGLE VISE—Swivel Base

ANGLE VISES—For Milling, Drilling, Grinding, Filing, Fitting, etc. Solve difficult angle jobs. Quick accurate set-ups without clamps, wedges or make-shift methods. Accurately machined and graduated. Hardened steel jaws, plain or grooved. $1\frac{1}{2}$ " to 8".

DRILL PRESS VISES—Accurately machined. Best semi-steel castings. Long bearing and adjusting screw. Jaws hardened steel—plain or grooved. Sizes $1\frac{1}{2}$ " to 4".

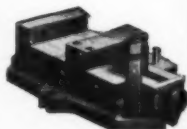
MILLING ATTACHMENT VISE—Just the fixture for milling operations on lathes. Fits 8"-9"-10" South Bend, Atlas, Craftsman, Sheldon, etc. Graduated vertical feed screw and 360° graduation for vertical angle adjustments. Mounts on cross slide and held by T-slot bolt. Vise has $2\frac{1}{2}$ " jaws 1-7/16" deep grooved and plain. \$24.75.

HEAVY DUTY PRODUCTION VISES—For fast, heavy work. Adjustable cam locking lever. Movable jaw, hardened and ground. Sizes 3" to 8" Jaws.

FLANGED MILLING MACHINE VISE—Clamps to table of milling machine, grinder, etc. Jaws hardened and ground. 6" wide, 2" deep.

Write for Circular 348

CHICAGO TOOL AND ENGINEERING CO.
Mfrs. of Palmgren Products for Over 25 Years
8384 South Chicago Ave., Chicago 17, Ill.



HEAVY DUTY PRODUCTION VISE



FLANGED MILLING MACHINE VISE



DRILL PRESS VISE



No. 250
MILLING ATTACHMENT VISE— $2\frac{1}{2}$ " JAWS

a little
PRODUCTIMETER
 that does
 a BIG counting job!



Use it on small machines, such as drill presses, bench presses, scales, conveyors, food packers, cutters . . . it's a sturdy counter, especially recommended for light service . . . it has a die cast base, steel stamped cover, oil-less bearings, $\frac{1}{4}$ " legible black figures . . . available in sizes to count from 1000 to 1,000,000.

• There's a unit in the Productimeter Line to meet practically every need, in Stroke, Rotary, Lineal and Electric models.

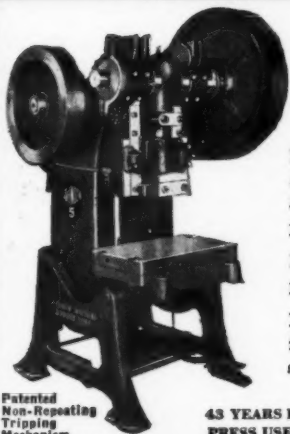
Bulletin No. 100—a concise, ready reference catalog of 100 standard models — sent at your request.

DURANT MANUFACTURING COMPANY

1928 N. Buffum Street
 Milwaukee 1, Wis.

180 Eddy Street
 Providence 3, R. I.

PRODUCTIMETERS
 (THE SPEEDMETERS OF INDUSTRY)



Patented
 Non-Repeating
 Tripping
 Mechanism

**UNLIMITED PEAK
 PRODUCTION**

Much larger die space than average presses. Engineered and designed for unlimited peak production.

Reinforced construction at points of greatest wear.

If you want the best, send for illustrated catalog describing complete line TODAY.



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JOHNSON MACHINE AND PRESS CORP., ELKHART, INDIANA



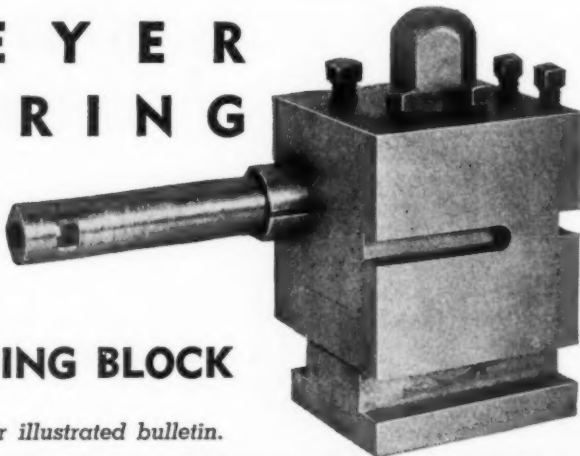
QUARTZ CRYSTAL LAPPING PLATES—John Weigel maintains a careful watch over this milling machine at the Dobbs Ferry, N. Y. Plant of North American Phillips Co., Inc. These plates must be reground, then recut with crisscross slots at periodic intervals. With proper abrasive mixtures, the plates perform the delicate grinding (lapping) process that brings quartz crystals down to the frequency desired. The company is manufacturing large quantities of these crystals for communication and other needs of the Armed Forces.

WESTCOTT CHUCK CATALOG

A 12-page catalog No. 600 may now be had from the Westcott Chuck Co., 1604 E. Walnut St., Oneida, N. Y. The company points out that the new catalog has been streamlined but all essential data including renewal parts prices are included. Information is given on ordering chucks and this includes a telegraph code. Many illustrations of their products, together with descriptive matter about each make this an informative and interesting booklet. It is available gratis, upon request.

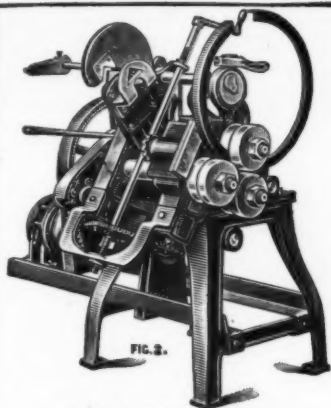
M E Y E R B O R I N G

and TURNING BLOCK



Write for illustrated bulletin.

MEYER TOOL & ENGINEERING CO., Saginaw, Michigan



No. 14 Angle Rolling Machine
ROLLS ANGLES, TEE IRON, PIPE,
FLATS, ROUNDS AND SQUARES
CAPACITY—2"x2"x¼" ANGLE

EXCELSIOR TOOL & MACHINE CO. EAST ST. LOUIS, ILLINOIS

HERE IS A *Machine*

THAT HAS FOUND ITS WAY INTO
40 States

used by Manufacturers of
SHIPS—PLANES—TANKS—AUTOMO-
BILES—ENGINES—FURNACES—
FARM MACHINES AND METAL
PRODUCTS OF ALL KINDS

also by
U.S. ARMY—U.S. NAVY—N.Y.A.
UNIVERSITIES

... There's a Reason!

DESMOND GRINDING WHEEL DRESSERS



Desmond Hex Dresser



Desmond Heavy-Duty Dresser



Desmond Huntington Dressers

Our Desmond
Huntington
Cutters are
made in all
sizes.



We manufacture only complete line of dressers and cutters on the market,
and will be glad to send samples for trial. Write for copy of our new catalog
and name of your nearest jobber.



THE DESMOND-STEPHAN MFG. CO.
URBANA • OHIO



\$29.75 in U.S.A. *Weight 12 Ounces; Length 6 1/4 in; Chuck Size 1/8 in. Wheel Guard Removed for Better Illustration*

The Model JA is new in design both inside and outside. In it are utilized fewer parts, and they are made of Magnesium and Aluminum for extreme featherweight lightness. The alloy steel shaft diameter is unusually large for sustained smooth and true operation. This means still longer wheel life and better grinding. The speed, as before, is governed at 50,000 R.P.M. and there are selected ball bearings, front and rear. The JA Featherweight is a distinct improvement over all models previously produced by Madison-Kipp, the originators of really high speed grinders.

The same low price, \$29.75 in U.S.A., remains. It is a post-war design for which materials have been released early. The pre-announcement output was geared to expected demand. Deliveries will be made out of stock as long as possible.

MADISON-KIPP CORPORATION
297 WAUBESA ST., MADISON 4, WIS., U.S.A.

IDEAL METAL ETCHER

Anything made of iron, steel or its alloys can be easily and quickly etched with the new "Tool Room" Metal Etcher announced by the Ideal Commutator Dresser Co., 1025 Park Ave., Sycamore, Ill.



It is especially suitable for marking tools, gauges, reamers, dies, punches, jigs, fixtures, etc. Marks numbers, sizes and other important information. The mark is burned right into the surface so that it cannot be worn off thru ordinary usage.

Depth of mark is controlled by etching heat and speed of writing. Four etching heats are provided viz., 120, 240, 420 and 700 watts. Outstanding features include red indicating lamp, protected four heat switch, removable hinged cover, terminal tap for "small" two ounce etching tool and renewable work plate. All parts are enclosed in a compact, attractive case.

In addition to the standard four ounce etching tool, a small two ounce tool is also available for marking thin delicate parts. Overall size is 7 1/4 x 5 1/2 x 8 1/2"; weight 16 lbs.

ACROMARK STEEL STAMPS

A three color folder giving complete data and prices to industrial plants upon Steel Stamps, is now available from The Acromark Co., 15 Morrell St., Elizabeth, N. J.

These are the Steel Letter and Figure Stamps developed for use of industrial plants producing heavy and light precision machine products.

Markings for convenient use, strong body, well designed shape and finish go into the making of these tools.

MODEL No. 16 "SPECIAL"

CONSTRUCTED AS PER SPECIFICATIONS OF U. S.
NAVAL AIRCRAFT FACTORIES

BUTTERFLY FILING and SAWING MACHINE

(Die Making Machine)

This is a very heavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D-10⁸ Table; Model E.L. 12⁸ Table.

HARVEY MFG. CORP.

161 GRAND ST., NEW YORK

Phone Canal 6-5170



**BEWARE OF
IMITATIONS!**

Our machine
carries the Butterfly
trade mark.

Registered U. S. Patent Office

"World's Finest Precision Ground Universal Joints"



DIX
PRECISION-MADE
and
AVIATION TYPE

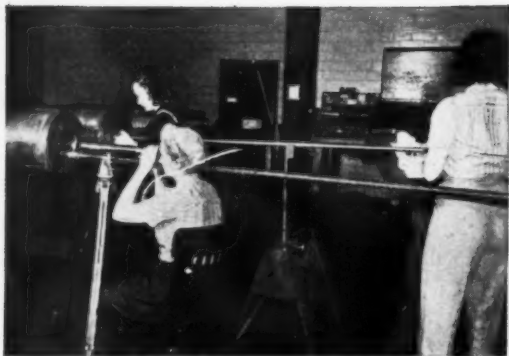
DIX Universal Joints come in 15 standard sizes, from $\frac{3}{8}$ " to 4" Hub Diameter made to Army, Navy, Air Corps spec. AN-40236 ready to install, or can be made to customer's specifications. Eliminate "rejects" with DIX Universal Joints! Write, wire for catalog, prices, specifications, etc.

DISTRIBUTORS TERRITORY STILL OPEN JOBBERS

Wherever perfect-functioning joints are required—Dix Precision-Made Universal Joints will give the utmost performance and satisfaction. Let Dix engineers help solve your problems.

DIX MANUFACTURING COMPANY
3447 EAST PICO BLVD. LOS ANGELES 23, CALIF.

**PRECISION
MADE
PRODUCTS**



"SURVEYING" A GUN BARREL—With the aid of a telescope and illuminated mirror, Mrs. Grace Augustus checks the bore of a 5" Navy gun for scratches or other mechanical defects at the Louisville Ordnance Plant of Westinghouse. Mrs. Augustus lost one son at Pearl Harbor, and has another who was reported missing while on submarine patrol. Her third boy is serving aboard one of Uncle Sam's destroyers somewhere at sea.

LYON-RAYMOND EQUIPMENT

A four-page folder, "Hydraulic Devices Engineered and Developed for Specific Applications", Bulletin 137 is offered by Lyon-Raymond Corp., 1859 Madison St., Greene, N. Y. Briefly, the bulletin discusses the many engineering problems that are being solved hydraulically and points out how hydraulics might also solve

others. There are a number of illustrations of their equipment which consists of lift trucks, elevating tables, sheet handling trucks, welding positioners, aircraft equipment, stationary elevating platforms, etc. An illuminating discussion of the desirable points and qualities of hydraulic devices is included in the bulletin.

C-F POSITIONERS



**When "Position"
Counts Most**

On automatic welding jobs, like the one illustrated here, position counts "most", and with the C-F Positioner (with 6 sizes, and capacities to 30,000 lbs.) the tables tilt to 135° beyond horizontal and rotate 360°, all under push button control. The exclusive C-F Variable-Speed Control gives table rotations ranging from 0 R.P.M. up for all sizes. For "quick change" of position, for greater time saving and efficiency, for lower costs and greater safety to men and materials, specify C-F Positioners for all automatic and production welding operations.

Write for Bulletin WP-22

CULLEN-FRIESTEDT CO.

1321 S. Kilbourn Ave.

Chicago 23, Ill.





**ONLY
\$42⁰⁰**

Complete
**QUICK SHIPMENTS
ON AA-5 PRIORITY
OR HIGHER**

NEW SAW-GUN

SAWS and FILES where no other tool can reach!

★ Now, many hard-to-get-at sawing and filing jobs that formerly required hours of time and the use of several tools, can be quickly handled with one tool—the SAW-GUN.

Propelled by electricity, compressed air or flexible shaft, this new tool will rapidly saw or file light and heavy gauge metals of every description, corrugated or plain. It's ideal for panel notching in metal, wood, plastics and other materials. In fact, the Saw-Gun may be used advantageously in a wide variety of applications.

Sold on money-back guarantee.

See Your Jobber or Write Direct for Quick Delivery!

MID-STATES EQUIPMENT CO.

2435 So. Michigan Ave. (SAW-GUN DIVISION) Chicago, Ill.

SAVE TIME ON INTRICATE ANGULAR SET-UPS . . .

MULTI-SWIVEL VISE



Fully universal . . . three swivels simplify the setting of compound angles. Parts interchangeable . . . can be used as a plain flanged vise, a swivel vise or multi-swivel vise.

The Platen greatly increases the capacity of the unit. Vise and Platen are interchangeable.

**Immediate Delivery
WRITE FOR
INFORMATION**



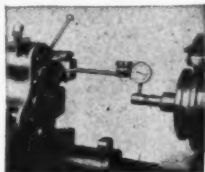
MASTER TOOL CO.

161 HIGH STREET • BOSTON, MASS.

... A NEW SUPER POWER MAGNETIC INDICATOR BASE



Newly designed magnetic base has twice the strength of other indicator bases now on the market. Provides quick easy indicator settings in any position. Eliminates clamps and fixtures. Will positively hold the indicator at extreme end of rod in vertical or up-side-down positions, even thru paint or grease. A release handle permits easy removal of the base without danger of marring the work. A trial will convince you that this item is not "just another novelty." Write for details.



MAIN ELECTRIC COMPANY, INC., Rochester 2, N. Y.



Douglas spar caps or struts are shown being milled with Carboloy Carbide Cutters. Use of such cutting materials enabled production lines to operate over long periods without cutter changes and yet, operated at materially higher speeds than previously possible or practical. (Courtesy — Douglas Aircraft Co., Inc.)

HOLDEN NEUTRAL BATH CATALOG

A revised and enlarged 32-page Catalog No. 120 is now offered by A. F. Holden Co., New Haven 8, Conn. It contains much helpful information on Neutral

Baths used for hardening and tempering, also data on their "Flow Heat Treatment" and the new Speed Nitriding Process. Interesting illustrations and diagrams help to give a better understanding of various products and services offered by this firm.

Minn-Kota TAP GRINDING TOOL

with Holding Fixture for Bench Grinder

This inexpensive equipment quickly saves its cost. You can regrind old, worn taps repeatedly and make them cut like new again. Grinds any desired chamfer and relief uniformly on all flutes of plug or taper taps, right or left hand. Send for circular.

MINN-KOTA MFG. CO., Dept. 904, Fargo, N.D.



Fixture adjustable to fit any bench grinder.

MATTHEW Patented

ROTARY TOOL CARRIER

is indispensable for finishing a complete multiple contour or irregular shaped milling job in ONE setting without use of Rotary table.

Capacity up to 7" diameter circle. Will fit any horizontal milling machine or can supply a suitable machine if required. Spindle speeds, standard 600 to 2800 R.P.M.

Rated capacity 1" end mills in steel.

Highly recommended for Metal Pattern, Molds of all kinds, Die Cast Dies, etc.

A quick self liquidating capital investment.

Descriptive matter on request.

PRODUCTION MACHINERY DEVELOPMENT COMPANY

4845 St. Aubin St.,

Detroit 7, Michigan



Precision Built REAMERS for Precision Work

STRAIGHT
SPIRAL
STEP
PILOT
HAND

Sizes starting from
030 diameter

On aircraft instruments - small dies - in-
motors - engines
radio - or ANY part that calls
for extreme reaming accuracy -
we are specially equipped to pro-
duce reamers - built to precise
existing standards - and give
you remarkably rapid delivery.

METAL CUTTING TOOLS AND MANUFACTURING CO.

11121 GRAND AVE. • DETROIT 4, MICH. • HOGARTH 9164-5

AN IMPROVED GUSHER



Ruthman offers a new Gusher Model HL-15025-B Deep Immersion Type Coolant Pump.

It is available in two lengths, 19" and 23" immersion below high level line of coolant reservoir. Mounting bracket is a circular flange type, 10½" in diameter, and is an integral part of unit, simplifying installation.

Entire rotating assembly is on a one-piece extended steel shaft, electronically balanced after assembly, and mounted in the motor on sturdy precision ball bearings. Like all Gusher Pumps, this new unit

has no packing glands or metal-to-metal contacts below high level line. This elimination of mechanical friction assures a generous, adequate flow of coolant on a

minimum of power consumption and attention.

Pumps are available with ¼ hp motors for continuous duty and ½ hp motors for extra heavy duty, in standard current characteristics.

Copy of a complete new Gusher catalog is available from the Ruthman Machinery Co., 1808 Reading Road, Cincinnati 2, Ohio.

GEAR FINISHER BULLETIN

The entire line of improved Model 860-B gear finishing machines operating on the crossed-axis gear shaving principle, are described in technical bulletin No.-B-44, now obtainable from Michigan Tool Co., 7171 E. McNichols Road, Detroit 12. The improved 860-B—designed for maximum production of both spur and helical gears—is built in three sizes for finishing gears up to maximum diameters of 8, 12, and 18" respectively. Gears up to 5" in width can be finished on all three types, and gears or splines as small as 1" O.D. may be shaved on any of the three sizes. Machines are illustrated with the new "Curve-Shaving" head, with which tooth thickness towards the ends of the gear teeth can be slightly reduced while shaving, to prevent concentration of loads on ends of gear teeth.



HOW DOES YOUR Coolant Smell?

Spoiled coolant is no better than sewage. Usually, such coolant gives off a sickening odor. It may turn black and putrid. But

under certain conditions, there may be no odor or visible signs of spoilage, yet the coolant may fail to perform properly because of its bacterial content.

Don't take chances where the correct Steridol germicide is guaranteed to maintain practical sterility and prevent spoilage. Costs but a fraction of 1¢ per gallon of coolant. Let a Dolge Service Man take samples on his next call or write for information.

THE C. B. DOLGE CO., WESTPORT, CONNECTICUT

STERIDOL *Cutting oil germicides*



USE

Fluid-Motion for Modern form-dressing

ONE

**SETTING
HANDLE
CONTINUOUS MOTION**

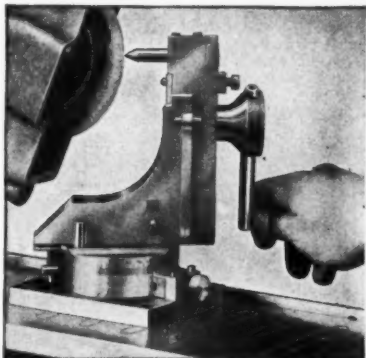
The J & S Model "E" Radii and Angle Dresser in the new "Fluid-motion" series is one of the finest precision dressing instruments procurable—regardless of cost.

FEATURES

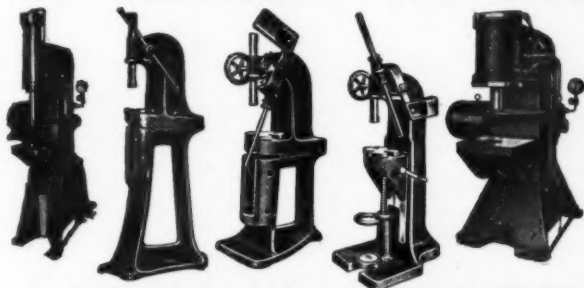
Fluid-motion dressing
.0001" accuracy
Automatic centering
14" wheel capacity
Large range yet compact
Chatterless and dustproof

J. & S. TOOL CO.

477 MAIN ST. E. ORANGE 2, N. J.



For AIRCRAFT and MUNITIONS



**1883
GREENERD**

The Originators
of the
Arbor Press

1945

PRECISION WORK IN MANUFACTURING

65 Standard Styles and Sizes. Manually operated presses $\frac{1}{4}$ to 35 tons pressure.
Motor driven hydraulic presses $1\frac{1}{2}$ to 30 tons pressure.

Let us send you our catalog No. F.

GREENERD ARBOR PRESSES

NASHUA

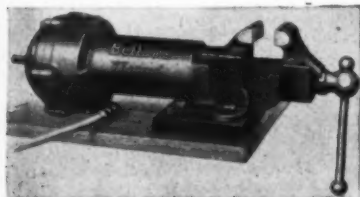
Est. 1883

NEW HAMPSHIRE

Complete specifications on all three sizes of machines, together with a list of standard and special items, are included in the bulletin.

VISPEED BENCH VISE

Vispeed, a new, powerful air or hand-operated bench vise has been developed by The Bellows Co., 861 E. Talmadge Ave., Akron, Ohio. This addition to their line of controlled air power devices consists of a standard 4" Reed bench vise operated by a powerful 8", foot-controlled, air cylinder. Clamping pressures are adjustable from zero up to 2½ tons, practical safety limit of the vise itself.



Vispeed operates thru the full range of the 6" jaw opening of the vise. Positive

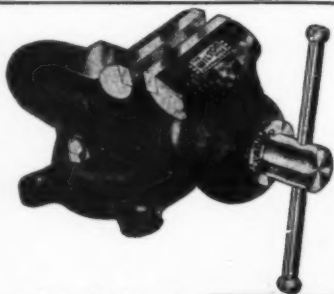
safety control limits air-powered movement of the movable jaws adjustable from zero to a maximum of 1".

Vispeed is foot controlled, leaving both hands free to handle work. Slight toe pressure closes jaws, heel pressure opens them. Jaws lock in either position. Normal hand operation of vise is possible at all times.

The vise is available as a complete packaged unit, consisting of a 4" standard Reed bench vise, an 8" air cylinder, pressure regulator, gauge, quick exhaust valve, air-hose and foot pedal assembly, or the air unit may be purchased separately for easy attachment to any standard 4" or 4½" vise.

GOTTSCHO INDENTA NO. 10

Indenta No. 10 is designed to mark straight line impressions on metal parts at a high production rate. The moving parts consist mainly of a sector of a round steel die, which makes ½ turn and stamps an imprint into the metal part. The die returns to its starting position, the marked part is removed and a new one put in its place. Operation occurs so quickly that production rates of 1200 parts per hour are not uncommon. The actual marking occurs in a fraction of a second, so that production is dependent on handling.



- Less Weight, yet greater efficiency.
- Absolute Precision.
- Every part interchangeable.
- Indestructible.



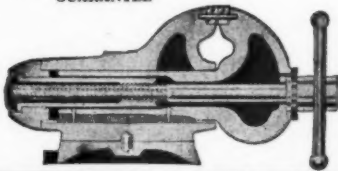
Write for Literature

ACME TOOL CO.

202 Church Street
New York 13, N. Y.

BENCH VISES

UNRESTRICTED 5-YEAR
GUARANTEE



Sizes & Prices

Width of Jaws	Maximum Opening
2"	2½"
3"	4½"
3" H.D.	4½"
4"	5½"
4" H.D.	7"
4½"	5½"
4½" H.D.	8½"
5"	8½"
6"	9½"

Sizes 2", 3", 4", H.D., 4½" H.D. and 6" were built to conform with Federal Specifications GGG-V-436, as required by Army, Navy, etc.

Approximate Weight	Price with Swivel*
4½ lbs.	\$10.40
21 lbs.	12.90
30 lbs.	15.80
37 lbs.	18.60
47 lbs.	21.00
39 lbs.	21.30
55 lbs.	27.50
58 lbs.	33.60
106 lbs.	62.00

Regularly furnished with Serrated Jaws.
Can supply smooth steel, brass or copper jaws.

*Subject to Discount

Have Your Plates Re-scraped

by a Nationally Known Surface Plate Manufacturer!



Equipped for precision
finishing by a staff of
**Skilled
Specialists**

*All Makes ... Moderate Prices
... Prompt Service ...*

**Write for Quotation
and Literature**

**Lapping Plates Made to Order!
Prompt Service!**

SQUARE SURFACE PLATE & TOOL COMPANY
221 N. MAIN ST. ROYAL OAK, MICH.

TIME SAVER FOR QUICK CHANGE MARKING

- Fastest and simplest way to number parts.
- Easy! Just turn screw to change numbers.
- Made of best quality tool steel.
- Guaranteed for years of service.
- **PROMPT DELIVERIES**

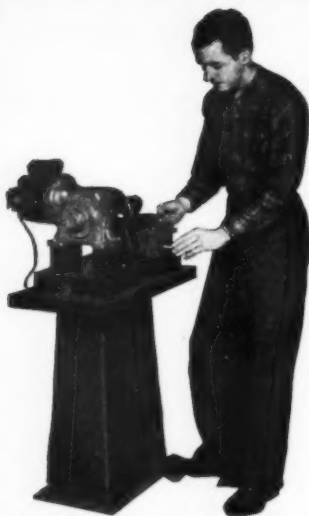
STOCK TYPE

- # 1... BA 1864249
- # 2... BA 186429
- # 3... BA 1864

SOSSNER

161 Grand St. New York 13, N.Y.





Changes from one die reading to another, may be made quickly. Adjustment

for variation in thickness of diameter of part being marked, and for depth of impression is made by a simple turn of a knurled wheel in front of machine. A bar locks this adjustment.

There is no operator hazard since her two hands are away from the operation of indenting. The die will not jam since a friction clutch acts as a safety to prevent this.

Unit comes equipped on its own stand with motor, gear reduction, friction and ratchet clutches, heavily constructed frames, precision bearings on turning parts, and roller bearings on all moving parts. The machine occupies little floor space.

The No. 10 has a capacity for marking metal parts varying in diameter or thickness from $\frac{1}{4}$ " to 2". Size of character of the indented impression depends upon the part being marked.

Address Adolph Gottscho, Inc., 190 Duane St., New York 13, N. Y. for further details.

HUNTER ELECTRO-COPYIST

Machine Model No. 50 has recently been announced by Hunter Electro-Copyist, Inc., 446 S. Warren St., Syracuse, N. Y. The exterior case is of seasoned gum surfaced plywood with walnut stain, and



NO. 11A PRESS

SPRING PRESSES

No. 11A-1A. FLOOR TYPE

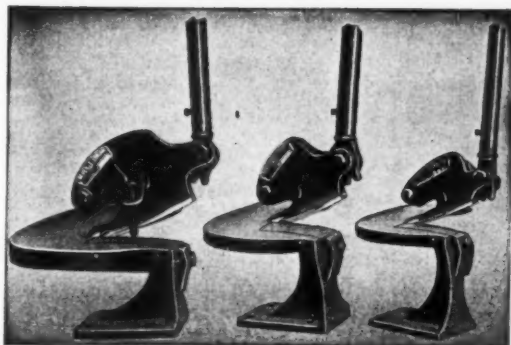
No. 00-0. BENCH TYPE

These machines are designed to deliver a quick, uniform blow repeatedly, regardless of variation in thickness of the work. They are used for riveting, staking, bending, forming, stamping and similar operations on light work.

Circulars Sent on Request.

REPRESENTED BY PRATT & WHITNEY

THE TAYLOR & FENN CO.
HARTFORD, CONN. U. S. A.



Get BEVERLY Throatless SHEARS

SAVE TIME ON WAR ORDERS!

If you're cutting straights or irregulars on War orders you can speed 'em up with a BEVERLY Bench-Type Shear. Order No. 1 for 14 Ga., No. 2 for 10 Ga., No. 3 for 3/16" mild steel and 10 ga., stainless.

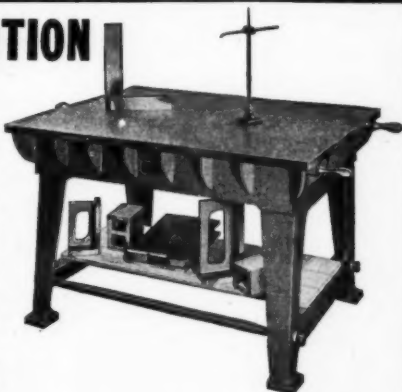
THE BEVERLY SHEAR MFG. CO., 3005 W. 110th Pl., Chicago 43, Ill.

A USEFUL ADDITION

Modern precision machine shops and inspection departments will find this sturdy 36"x 48" MILWAUKEE SURFACE PLATE a valuable addition. Constructed of semi-steel, accurately machined, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate 30". Can also be had in 38". Shipping weight 1200 lbs.

We also manufacture angles and parallels as shown underneath surface plate.

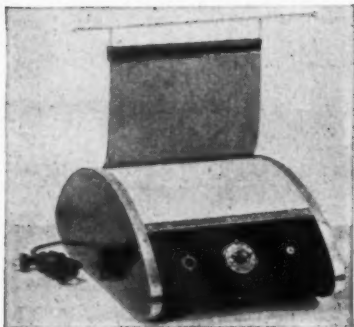
We also make larger and smaller plates either with planed or scraped surfaces, whichever is desired. Write today for full information.



J. C. BUSCH COMPANY

165 SO. BARCLAY ST.

ENGINEERS AND MACHINISTS
SINCE 1907
MILWAUKEE 4, WIS.



bright chrome trim. The pressure surface is Fabricoid covered, with tension springs attached to metal rod, which is pulled into metal hooks attached to front of machine. It is lighted by 4-60W and 6-40W lamps. The 60 watt lamps used for making negatives; both 60W and 40W are used for positives. Toggle switch controls lighting. Period of exposure is controlled by Rhodes mechanical timer, mounted on front of machine. Overall dimensions are:

—width 14 $\frac{1}{4}$; length 24 $\frac{1}{2}$, height 8 $\frac{1}{2}$ ", and approximate weight is 25 lbs.

UNIQUE ZAGAR SET-UP

A standard Zagar Air-O (Air-operated) Holding Fixture in conjunction with the new Warner & Swasey Precision Tapping and Threading Machine turns out one piece every three seconds—a remarkable increase in production.

A special mounting by Warner & Swasey tips the fixture about 20° for loading and unloading, thereby saving time that would be consumed in raising the spindle more than an inch above the work.

The operator merely steps on a treadle, which tilts the Holding Fixture to load. When treadle is released, fixture is returned to vertical position by a spring.

A micro-switch then starts operating cycle. When cycle is completed, machine stops.

Automatic valves were installed at the control box to open and close the collet when fixture is tilted for loading and unloading. Air pressure is used only to operate opening and closing mechanism. Fluctuation in air line pressure does not affect holding power of fixture.

Amazing Production via the Tapmaster!

Visitors at the Cleveland Metal Congress saw 1480 $\frac{1}{2}$ " 20-thread automotive yokes being tapped per hour (a tricky job). The Tapmaster can easily tap 1200 $\frac{7}{8}$ " or 2000 $\frac{1}{2}$ " holes per hour.

This unit, new but proven, can do three different jobs at once, tapping any size hole up to $\frac{7}{8}$ ". Three separate motors—three tapping machines in one!!! Either single or continuous cycle. Positive feed by husky lead screw prevents tearing of threads. Safe—no jamming of work. Ample tanks for coolant oil (no gushing). Ready accessibility.

Get our Bulletin "B"

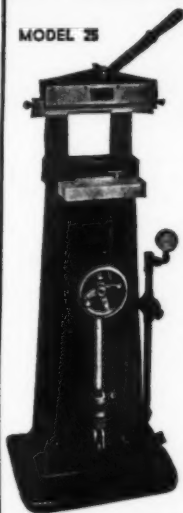
Pruett Machinery & Tool Co.

5295 West 130th Street
CLEVELAND 11, OHIO

"TRIPLE UP" with the Pruett TAPMASTER



MODEL 25



MARK YOUR PARTS

Permanently

PART NUMBERS
HEAT NUMBERS,

CATALOG NUMBERS,
SERIAL NUMBERS,

PATENT NUMBERS

MANUFACTURER—INSTRUCTION DATA—INSPECTION

Positive, Permanent marking on your products assist prospects to order. Makes it easier to buy—new, repeats and repairs. Gives you a definite record of pertinent data on each part produced.

The Pneumatic marking machine illustrated is our HI-DUTY model 25 general purpose tool for short runs or production work. It operates from your shop air line and is one of numerous models built to produce neat, permanent markings quickly on metal fabrications.

We will be happy to make specific recommendations upon receipt of samples or prints of parts to be marked, showing approximate lettering, its location on the part, with required hourly production.

MARKED PARTS ADVERTISE

IN THE RIGHT PLACE, AT THE RIGHT TIME.

*Send for complete catalog of our full line
of marking Tools, Machinery and Equipment.*

GEO. T. SCHMIDT, Inc.

1802 Belle Plaine Ave.,

Chicago, Ill.

Off the Floor Deliveries!
ON

**TRINDL SUPER INDUSTRIAL
ARC WELDER**

DESIGNED FOR HIGH SPEED PRODUCTION ARC WELDING

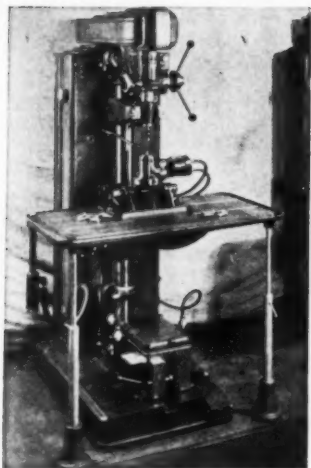
TRINDL SUPER INDUSTRIAL ARC WELDERS, the result of many years of careful engineering and "job tested" research, are setting up impressive production records. Acclaimed for superior performance, ruggedness, dependability, and economical operation. For better, faster welding, easy-to-operate TRINDL SUPER INDUSTRIAL ARC WELDERS will help step up your production schedules 20% to 40%. Manufactured in a range of distinctive sizes to accommodate every type of shop and production welding job. Trindl Welders, Electrodes, supplies and accessories, available for immediate delivery, will save you both time and money.

Write, wire or phone for full details



TRINDL PRODUCTS, LTD.

17 EAST 23rd STREET AT
CHICAGO 16, ILL.

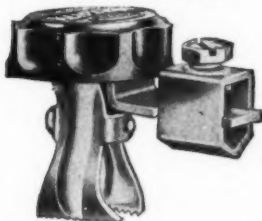


This fixture uses standard 14 AC No. 2 collets. A most important feature is that

collet does not move vertically in closing. Consequently, work can be held to close tolerances in second operations, such as milling slots on a milling machine, drilling and tapping to a given depth, counter-boring or spotfacing on a drill press, etc. There are provisions for a stop in fixture to insure duplicating of parts.

Please send all inquiries to Carl W. Wolf, Sales Manager, Zagar Tool, Inc., 23882 Lakeland Blvd., Cleveland 17, Ohio.

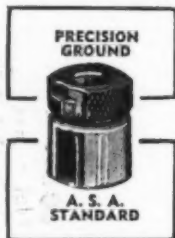
TRICO TEST CLAMPS



This new test clamp line, employing powerful jack-screw gripping action, is recommended for making heavy duty temporary connections; motor and meter

DRILL JIG BUSHINGS

That Insure Precision Work . . . Eliminate Guesswork!



**IMMEDIATE
DELIVERY**

SIMPLIFIED ORDERING

Specify (a) Drill Size, (b) O.D., (c) Length, in the order named, also the symbol for the type of bushing required.

FOR EXAMPLE—

- "P— $\frac{1}{4}$ x $\frac{13}{32}$ x $\frac{3}{4}$ " would mean "Press Fit bushing .2501—.2504 I.D. x .4075—.4078 O.D. x $\frac{3}{4}$ long."
- "S.R— $\frac{11}{32}$ x $\frac{3}{4}$ x $\frac{1}{2}$ " would mean "Slip Renewable bushing .3438—.3442 I.D. x .7498—.7500 O.D. x $\frac{1}{2}$ " body length."

SPECIAL BUSHINGS

All types o. precision bushings made to order. Steel or non-ferrous metals. Close tolerances up to .0001".

Write for Literature

ACME TOOL CO.

202 CHURCH STREET

NEW YORK 13, N. Y.

STOP

DRILL, TAP AND REAMER BREAKAGE

with **BUFFALO**

TORQUE CONTROL COUPLINGS

Based on the fact that torque and inertia are the fundamental principles of all drilling, reaming and tapping operations, the **BUFFALO TORQUE CONTROL COUPLINGS** are designed to eliminate drill, tap and reamer breakage by acting as a safeguard between the driving power and the tool.

When adjusted at a fixed torque to perform a particular operation, these couplings automatically throw out when over-loaded, thereby severing the driving power thru the coupling itself, but automatically re-engage and re-assume the driving power when the overload has been removed.

Available in single and multiple disc types, in sizes for all operations on drilling machines, lathes, turret lathes, horizontal boring mills, etc.

Also manufactured as **STUD DRIVERS, NUT SETTERS AND TRANSMISSION TYPES.**

Write for complete descriptive Bulletin No. 1005 today!

BUFFALO MACHINERY CO., INC.

838 Grant Street

Buffalo 13, New York



Machine
Tool Type

The COLBORNE Speed Lathes

SPEED UP FINAL OPERATIONS ON DIES . GEARS . SCREWS . LONG RODS

A recent addition to the COLBORNE line of Speed Lathes is the Series 30 machine. This speed lathe is indispensable for economical polishing, grinding, burring and lapping.

Very compactly constructed to do highest quality work with the COLBORNE features of spindle bearings running in oil, instant stopping brake, easy opening collet and standard speeds of 600-920-1720-3280-4800 RPM using 3/4 H.P. motor and cone pulleys. Collets and chuck may be used.

For more production per day choose COLBORNE.

PROMPT DELIVERIES

Write for Details Today.



COLBORNE MFG. COMPANY

BUILDERS SINCE 1879

157 Division St.

Chicago 10, Ill.

testing, jumpers, cable and bus-bar taps, battery charging, welding, and many other shop and laboratory purposes. Once applied they "stay put".

A slight twist of the finger-tip safety knob exerts tremendous pressure, supplying large carrying capacity of 20 to 350 amperes on constant and intermittent duty.

Solderless lugs provide quick electrical connections without use of special tools or cutting into wire; arranged to swivel around clamp, permitting wires and cables to hang in a natural position after installation.

Available in six sizes to fit across ferule and knife blade fuse clips, switch blades, round or flat bus-bars, cables, etc.

Copy of descriptive Bulletin No. 7 may be had from Trico Fuse Mfg. Co., 2948 N. 5th St., Milwaukee 12, Wis.

RECORDING VIBRATION

Westinghouse has aimed squarely at the requirement for a quick simple means of recording vibration on the spot, and the result is a "little black box" called the Vibrograph. In the past, the problem of recording vibrations in some remote corners of a plant or in buildings far removed from laboratory facilities was difficult to solve. Altho portable vibration recorders were available, most were large, heavy, and required an external source of power.

About the size of an ordinary box camera, the Vibrograph weighs less than nine pounds and requires no power connection. Yet this device writes a permanent record of vibrations over the range of 600 to 15,000 cycles per minute and amplitudes as low as .0001" or as great as 1/16". The record and a timing wave are drawn by a stylus on a transparent plastic tape only one inch wide, and viewed by a low-power microscope.

The Vibrograph is a purely mechanical



device. It achieves mechanical amplifications of about eight, using the same principle by which earthquakes are recorded. It consists in the main of a frame containing a mass suspended by a weak spring. A pointer attached to the mass indicates relative motion between frame and mass when the frame is applied to a vibrating body. The Vibrograph makes its mark on the tape, either when resting on the vibrating body or when held in the hand and the vibration is picked up by a prod.

CENTRAL MICROMETERS

Central Tool Co., Auburn, R. I. are presenting a new line of Certified Accuracy Micrometers. The entire line of micrometers is described in their new Catalog No. 14.

DIES, FIXTURES, JIGS AND TOOLS

For Manufacturing

ELECTRIC MOTORS

We have for sale equipment for the manufacturing of motors up to 5 H. P.

CANATSEY ELECTRIC MANUFACTURING CO.

620 Wyandotte

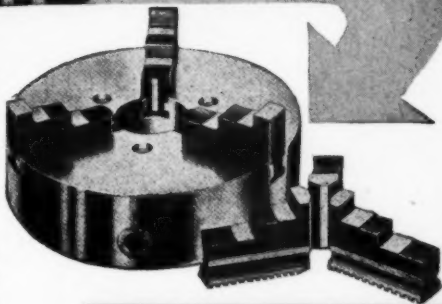
Kansas City, Missouri

ALMOND

GEARED SCROLL LATHE CHUCK

Bodies are one piece construction of close grain nickel alloy castings. Jaws are made of special alloy—steel hardened through.

Manufactured in sizes from 4" to 15" diameters. Furnished complete with two sets of Jaws.



*Complete Details
on Request*

T. R. ALMOND CO.

ASHBURNHAM,

MASS., U.S.A.

SPEED INDICATOR

SPEED CHANGE HAND WHEEL

BELT GUARDS

BELT TENSION KNOB TO CHANGE BELT FROM DEAD CENTER TO CHUCK WORK

"SCHULTES" ... The King of Motor Drives!

For External and Internal Grinding Machines

QUIET SHOCKLESS OPERATION
LOWER MAINTENANCE COST
ADDED FLEXIBILITY
GREATER SAFETY
MORE POWER

No. 2 Brown & Sharpe Universal Grinder motorized with Schultes Motor Drive Equipment

SCHULTES TOOL & ENGINEERING CO.
3377 Gratiot Ave., Detroit 7, Mich.

A detailed illustration of a motorized grinding machine. On the left, a large, complex motor assembly is shown, featuring a speed indicator and a speed change hand wheel. A belt guard is positioned over the motor's drive mechanism. A belt tension knob is also visible. The motor is connected via a belt to a smaller motor unit on the right, which is part of the grinding machine. The grinding machine itself has a large wheel and a chuck work area. The entire setup is mounted on a sturdy base.



The new black and enamel finish forged steel micrometers from 1 to 6" are available at prices considerably lower than the polished frame type. Frames are drop forged of special alloy steel with permanent non-corrosive baked black enamel finish.

PUNCHES AND DIES FOR ALL MAKES OF POWER MACHINES

Large range of Round, Square, Flat and Oval sizes carried in New York stock.



Special Tools
and

Odd sizes made to order.

Catalog No. 8 covering our complete line of Metal-Working Tools available.

T. H. LEWTHWAITE MACHINE CO.
311 East 47th St., New York 17, N. Y.

The polished frame micrometers with decimal equivalents are available in 1 and 2" sizes. The black forged steel micrometers are available in all sizes from 1 to 6".

SENSORY TORQUE WRENCH

The P. A. Sturtevant Co., Addison, Ill., announces a Sensory Torque Wrench which they report to be the culmination of seven years' research—a wrench that in use is said to be faster than that, still a true permanently accurate Wrench that will stand all ordinary shop abuse and yet remain accurate.

The Sensory model closely resembles the familiar Torque Wrench in appearance. Whereas the Torque Wrench depended solely on visual reading to determine the applied torque, the new model embodies two other features—"sound" and "feel".

A trigger finger is provided which can be set at any desired signalling point. As torque is applied with the wrench, and at the exact instant the "set" torque is reached, the sensory action (1) sounds a loud and distinct click and (2) imparts a definite strong impulse to the hand. Thus, thru three senses, sight, sound and feeling, the operator automatically releases (by reflex action) his pull on the wrench (even before the conscious mind reports it) making torque both fast and dead accurate.

Hendy Diesels now being built for the U. S. Maritime Commission require 18 ground cams: 6 intake, 6 exhaust, and 6 fuel. Shape of the intake and exhaust cams is identical.

FABRICATED TUBE PARTS

A very attractive brochure describing the diverse operations employed in fabricating tubular parts of seamless copper, brass, and aluminum has been released by the Wolverine Tube Division of Calumet and Hecla Consolidated Copper Co., Detroit, Mich. It is profusely illustrated and carries many charts and tables which should prove useful to anyone working with copper tubing. Copies are available to persons requesting them on their own letterheads.



Diamond SELF-CENTERING VISE

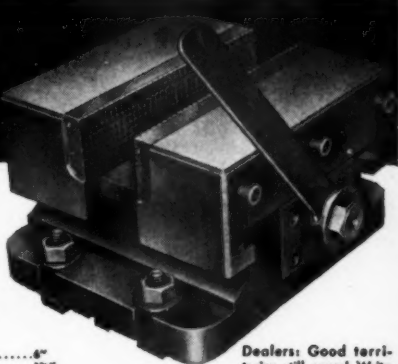
Immediate deliveries from stock, no delay!

CENTER your milling cutter, shaper tool or drill to these two vise jaws, and work is automatically centered—regardless of thickness variations! Both serrated jaws move equally and simultaneously by a hardened alloy steel screw. Rapid operation, "bulldog" grip. Compact, semi-steel castings, with minimum overhang, "beefed-up" for maximum strength, tongued on base for centering in table slot.

DIMENSIONS

Overall Height.....	4 1/2"	Width of Jaws.....	6"
Overall Width.....	6 1/2"	Depth of Jaws.....	1 1/4"
Overall Length.....	7 1/4"	Maximum opening.....	3"

Net weight complete with 4 hold down bolts 1/4" diameter, approximately 36 lbs.
Price: F.O.B. Factory, \$65.00



Dealers: Good territories still open! Write for folder, information.

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3427 EAST OLYMPIC BOULEVARD, LOS ANGELES 23, CALIFORNIA

Manufacturers of the DIAMOND Line of Precision Milling Machines and Accessories



E-N-G-I-N-E-E-R-E-D To Fit YOUR Product

For over a quarter century we have been making clutches of all kinds. This clutch building experience has developed a specialized engineering service of value to manufacturers whose product designs require special clutch applications. It is a good idea to use standard clutches, where practical, but if your need is out of the ordinary, it will pay you to get the recommendations of our power transmission engineers regarding the clutch which will meet your specifications exactly.



SEND FOR THIS HANDY BULLETIN ON POWER TRANSMISSION

It shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications. Every production engineer will find help in this handy bulletin, when planning postwar products.



PULLMORE CLUTCHES

**Rockford Drilling
Machine Division**
Borg-Warner Corporation
1309 Eighteenth Avenue, Rockford, Ill.



LOGAN QUICK CHANGE GEAR TURRET LATHE

In diversified industrial fields, the Logan No. 840 Quick Change Gear Turret Lathe is earning a reputation as a rugged, dependable production machine. It handles bar stock up to and including $\frac{5}{8}$ " diameter.

Typical of its advanced design are such features as precision pre-loaded ball bearing spindle mounting; adjustable gibs to compensate for wear of turret and cross slide; and self-lubricating bronze bearings protecting 35 vital points in the lathe. Guaranteeing accuracy are such construction specifications as bed ways ground to within .0005" of absolute accuracy, total run-out of headstock spindle $\frac{12}{100000}$ " from the bearing less than .001"; lead screw held to within .002" in 12"; and turret holes bored from the headstock.

The quick change gear box provides 48 threads and feeds in either direction. Simple adjustments of two levers provide screw threads of from 8 to 224 per inch, and by changing the 24 tooth stud gear, for the 48 tooth stud gear furnished with the lathe, additional threads of 4 to 7 per inch are equally accessible. Similarly, longitudinal power feeds from .0015" to .1000" per revolution on the spindle may be obtained. Power cross feeds are .25 times longitudinal feeds.

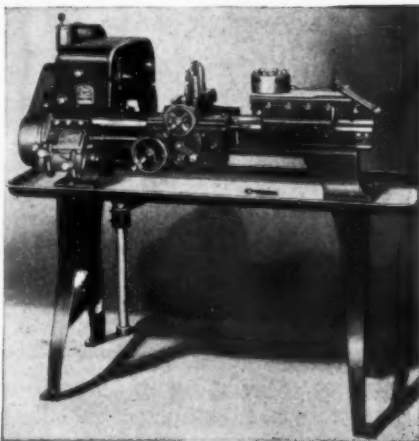
Another interesting feature is the Automatic Apron which operates from a spline in the lead screw thru a worm drive friction clutch for both longitudinal and cross feeds. For cutting threads, an additional longitudinal drive operates from half nuts on the lead screw.

Full information, and complete specifications are available from Logan Engineering Co., 4901 West Lawrence Ave., Chicago 30, Ill.

HIGH AMPLIFICATION GAGING

An unusually high amplification Precisionaire has been developed by Sheffield Corp., Dayton, Ohio to meet the urgent needs of what is stated to be one of the most critical items in war production at the present time.

It provides an amplification of 20,000 to 25,000 to 1 (a spread of 2 to $2\frac{1}{2}$ " per .0001") on internal measuring and is graduated in five-millionths of an inch increments. After a number of them had received exhaustive tests in a war plant, they proved



extremely accurate in rapid checking of critical internal dimensions on fuel injection equipment, having a tolerance of plus-or-minus five-millionths (.000005) of an inch. Today 100 of these instruments are in use in this plant.

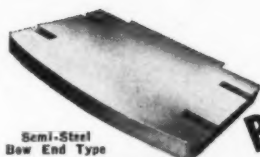
Model No. 600-0 is suitable for tolerances ranging from .0002 to .000005" with amplification from 15,000 to 25,000, depending on the part to be checked (a spread of $1\frac{1}{2}$ to $2\frac{1}{2}$ " per .0001"). In the Precisionaires, action of the floating indicator is just as quick and stable as other lower magnification models which have been in use by industry for several years. The base instrument has the same general appearance, but has been modified with specially built high precision metering components.

STICK FORM LUBRICATION

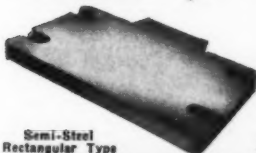


Slipstik, a new medium-soft wax-like graphite lubricant in handy solid form, is offered by Joseph Dixon Crucible Co., Jersey City 3, N. J.

Fast rub-on lubrication and ease of application are features of this all-around



Semi-Steel
Bow End Type



Semi-Steel
Rectangular Type

**BOLSTER PLATES
for POWER PRESSES**
*Why risk destroying an expensive set of dies
with worn or badly used Bolster Plates?*

*Now is the time
to make repairs.*

Complete facilities at our Bridgeport and Detroit Plants for manufacturing any type of Bolster Plate to your specifications from Semi-Steel Casting or Steel Plate. Any size or shape can be made. Send template or drawing showing design needed. Prices are right. Deliveries fast.

Manufacturers of Producto Die Sets and Modern Shop Tools.

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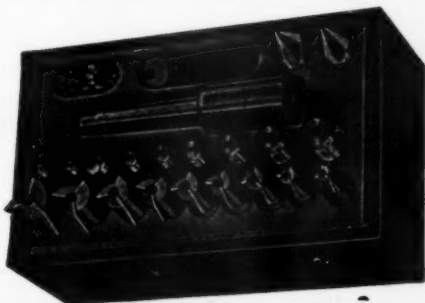
Counterbore Sets

These handy Gairing kits speed production on all counterboring and spotfacing operations. Available in seven sets containing a neatly boxed assortment of interchangeable counterbores, pilots and holders. Write today for prices and literature.

THE GAIRING TOOL CO., Detroit, Michigan



This set consists of one Type B-2 holder, 9 cutters ranging from $\frac{3}{8}$ " to $1\frac{1}{8}$ ", 9 pilots from $\frac{1}{4}$ " to $\frac{3}{8}$ " and 2 countersinks $\frac{7}{8}$ " dia. — 70° and 80°.



graphite lubricating stick. It is enclosed in a cylinder, 3" long by $\frac{3}{8}$ " in diameter.

Each end is provided with a disc. By pressing one disc inward, stick is ejected to required length for application. After using, the other disc is placed on top of

the exposed stick and pushed inward.

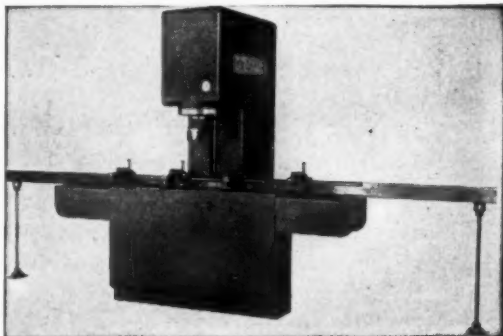
It is intended for quick, lasting rub-on lubrication in maintenance and servicing uses. It adheres lastingly to metal, wood, fibre, leather and all hard and soft materials.

COLONIAL STRAIGHTENING PRESSES

A line of hydraulically operated and accurately controllable straightening presses is announced by Colonial Broach Co., Box 37, Harper Station, Detroit 13, Mich.

They are designed for straightening both finished and rough work, and incorporate many of the construction and operating features which have contributed so much to the successful operation of Colonial Broaching machines and assembly presses.

Machines are of rugged reinforced welded steel construction with built-in motors and direct acting hydraulic cylinders built into



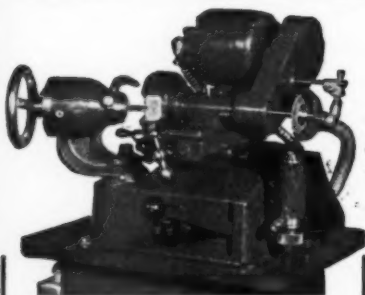
heads of the machines. Sensitive control is provided thru light pressure hand control and pedals. A pressure gage mounted on head of machine in front of operator indicates exact pressure being applied to the workpiece.

Straightening fixtures are equipped with center or roller type work supports according to whether finished or rough work (such as forgings, upset shafts, etc.) is to be straightened. These supports are mounted on a long guide rail—particularly useful when long shafts are to be straightened, since they will prevent possible sagging of work beyond work anvils.

An important feature of the work supports is that their mounting on guide rail is thru free action rollers. This facilitates rapid shifting of supports to either side of ram, for supporting work at various intervals during straightening.

Ram nose and work support anvils of the new line can be furnished in bronze instead of steel, if desired, to protect finished surfaces during straightening.

The machines are available in a number of capacity ratings, ranging up to 50 tons.



HYBCO TAP GRINDERS

**Sharpen ALL The Vital Points
CHAMFER • FLUTES • SPIRAL POINT**

Fast—easy to operate. Complete—no parts to change. Capacities—No. 2 to $1\frac{1}{2}$ " hand taps—with interchangeable heads.

**HEADS ONLY AVAILABLE FOR USE ON
UNIVERSAL TOOL & CUTTER GRINDERS.**

Write for Circular MTG

HENRY P. BOGGIS & CO.

1279 W. Third St., Cleveland 13, Ohio

BRAZING CARBIDE TIPS

A new well illustrated 4 page Bulletin 11-A on the subject of Brazing Carbide Tool Tips with Easy-Flo No. 3, has been issued by Handy & Harman, 82 Fulton St., New York 7, N. Y. It gives explicit instructions and shows many typical examples.

ERRINGTON MECHANICAL LABORATORY

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New York Office
170 BROADWAY

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*Our High Speed Tappers
are Super-Sensitive for
Small Tapping*



*All
Styles
and
Sizes—
0 to 2"
Taps*

*Style B
Positive
Adjustable
stop holds
work down*

*Style C Graduated
Adjustable Safety
Friction*

Style D-E, Quick Change Tools

PRODUCTION NOW and POST-WAR

Manufacturers of automotive vehicles, aircraft, radio, etc., for war and peace, will find this a dependable source for all types of metal fabricated parts. Our facilities for stamping, forming, drawing, machining, welding, brazing, soldering, riveting, plating, polishing and painting are unequalled. Our equipment is modern and our labor is stable. Tell us what you need and get our proposition. No obligation.

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IMMEDIATE DELIVERY

**CONSTANT LEVEL
LUBRICATORS**

— Exclusive in Design —



- **DEPENDABLE**
- **AUTOMATIC**
- **ECONOMICAL**
- **CLEAN AND SAFE**

Supplies only as much oil as bearing uses. A filling, therefore, lasts a long time. Especially helpful for oiling those high up or hard-to-get-at bearings.

WRITE FOR CATALOG

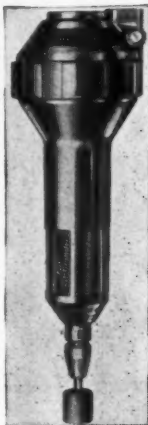
← General Purpose
Style B
1-32 ounces

OIL-RITE CORPORATION

3472 South 13th Street, Milwaukee 7, Wis.
LUBRICATING EQUIPMENT SPECIALISTS
Gravity Feed—Wick Feed—Loose Pulley—
Oil Cups

MODEL JA GRINDER

A new feather-weight hand grinder is announced by Madison-Kipp Corp., 207 Waubesa St., Madison, Wis. It was made ready for post-war production but can be manufactured now because of the availability of Aluminum and Magnesium. It is described by the manufacturer as being completely new, inside and outside. Speed of the standard model is 50,000 rpm altho higher speeds can be made available.



The grinder contains a total of only 23 parts and this figure includes such minor items as name plate and drive screws. Over-all length is 6½" and weight is 12 ounces. This extremely light weight is accomplished by use of Aluminum and Magnesium parts. The grinder accommodates Kipp mounted grinding wheels, cutters and other accessories having ½" diameter shanks.

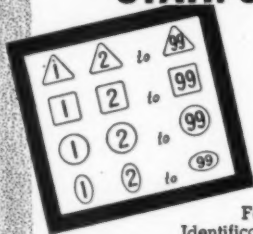
Shaft diameter has been increased over former models. It is made of 9/16" round alloy steel, ground to .547" (former size .315"). This shaft is mounted on two selected special high speed New Departure ball bearings with Formica Retainers. The large size of shaft tends to increase stability of grinder which promotes smoother running. This in turn, increases grinder efficiency and adds to length of grinder wheel life. Speed is closely controlled by a new sleeve type governor.

Higher speeds than 50,000 rpm may be obtained at additional cost but the Corporation requests that supporting engineering data be submitted to substantiate higher speed requirements. Higher speeds are not recommended unless absolutely necessary and unless the operation will be carefully supervised.

The grinder will operate on air pressures of from 30 to 120 pounds but ideal results are obtained from the usual shop air pressures of 80 to 90 pounds. Air consumption is said to be unusually low due to the over-all efficiency of this new grinder.

Madison-Kipp has installed a complete new Grinder Department with new precision machines. Each grinder is test-

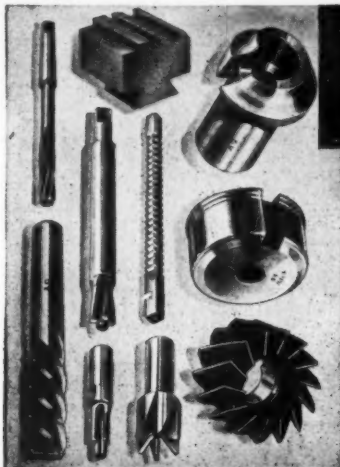
**New STEEL
INSPECTOR'S
STAMPS**



**Faster
Identification
of Inspectors or Operators.**
Different borders may be used for different shifts. Available in 4 sizes. Write for prices today.

NEW METHOD STEEL STAMPS, Inc.

187 JON CAMPAU DETROIT 7, U.S.A.



We Solve

TOUGH TOOLING PROBLEMS

GUARANTEED ACCURACY — PROMPT DELIVERY

We specialize in precision work and in getting it out ON TIME!

End Mills, Reamers, Counter-sinks, Dovetail and Circular Form Tools, Shell End Mills, Gages of all Types, Centerless Grinding.

For Quick Quotations, Write—Wire or Phone BUCKingham 3417

ANDERSON AND QUIGLEY CORPORATION

2329 Nelson Street, CHICAGO 18, ILLINOIS

SMITH MASTER PLATES

- ★ Exclusive Elliptical Reinforced Rib Design
- ★ Maximum Rigidity
- ★ Precision Accuracy to 1/10,000

You can best meet the demands for greater accuracy in production inspection with Smith Master Surface Plates. Available in a wide range of sizes from 8x12 to 36x68 inches. Our deliveries are now being made promptly.

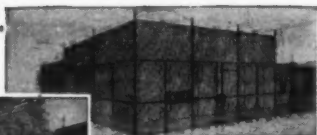
SMITH TOOL & ENGINEERING CO.
855 N. Sandusky Ave., Bucyrus, Ohio



Surface Plates
Lapping Plates
Platen Finish
Plates
Stands



**WINDOW
GUARDS
WIRE MESH**



**WIRE MESH TOOL CRIBS
TO PROTECT TOOLS,
MATERIAL AND EQUIP-
MENT MINIMUM VEN-
TILATION LOSS — OB-
STRUCTION FACTOR.**

**MAXIMUM ECONOMY OF METAL
REARRANGEABLE TO MEET CONDITIONS**

Acme **SEND FOR CATALOG**
WIRE & IRON WORKS
CANFIELD & MORAN STS., DETROIT 7, MICH.
THIS IS OUR FORTY-SIXTH YEAR

Certainty!

Correct and maintained reductions positively determined, when your reducer installations are ABART.



**Abart
SPEED REDUCERS**

Compact, Oil-tight, Dust-Proof. Over 75 types and sizes. Let us know your needs.

ABART GEARS. Made to specifications only. No stocks.

Abart **GEAR AND MACHINE CO.**
MANUFACTURERS OF
Speed Reducers & Gears
401 WEST 16TH ST. CHICAGO 12, ILL.

ed for speed with an electronic tachometer.

Madison-Kipp points out from their 15 years' experience in manufacturing high speed grinders that the two most important factors in successful operation of high speed air tools are clean air and proper lubrication. Special air cleaning devices are recommended as well as airline lubrication and special lubricants. If tools are to be used only intermittently and by skilled mechanics as in toolrooms, an auxiliary oiler is provided on the back plate.

Disassembling, cleaning and re-assembling has been made completely simple in the Model JA. The grinder comes apart by removing one lock screw and one lock nut.

With each grinder is supplied eight feet of $\frac{3}{8}$ " OD air hose, wheel guard, wrenches, oil, four assorted Kipp grinding wheels and dressing stone. Grinder and accessories are nested conveniently in a container.

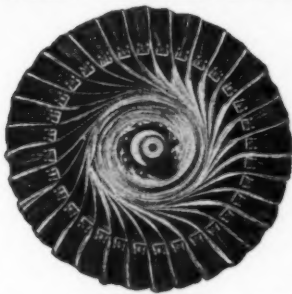
CLOSER MEASUREMENTS

THE close measurements made possible thru the use of gage blocks, depend not only upon initial accuracy, but on that accuracy being maintained. Gage blocks are precision instruments and should be handled as such. In addition, periodical check-ups should be made to be certain that they retain their accuracy. One way in which this is being done in some places is to use comparator devices. One of these, altho especially adapted for checking gage blocks, is also employed for checking gages of various kinds, and for working parts also. The work being tested or compared is slid under a contact pin, and a reading is obtained from a pointer traveling a graduated scale at the top.

Comparators of the optical projection type throw magnified shadow images of the workpieces on screens for close and deliberate inspection. Such equipment has found increasing use in recent years. Even those who are ordinarily hard to convince are beginning to see the importance and utility of this modern method of magnifying, comparing and measuring.

No greater tribute, perhaps, could be given to a specific method of measuring and comparing, than its development and promotion by those who actually manufacture and sell an outstanding line of metal-working machinery. It is a fact that this is done by a prominent manufacturer of turret lathes, automatic lathes and threading equipment. This firm supplies

THE VONNEGUT BRUSH-BACKED ABRASIVE HEAD



Vonnegut Brush-Backed Abrasive Head with end cap removed showing magazine loading of 32 strands of abrasive cloth with ends extending along-side of the 32 radially projecting brushes.

An efficient means for deburring irregularly shaped edges and smoothing surfaces forming a combination of curves and corners in preparation for other finishing operations.

It is used on metals too hard for effective results with wire wheel brushes and on the kind of work that takes too much time when done with files or small grinding wheels.

"A better quality of work and four times the quantity of work per man with the Vonnegut Abrasive Head," is the report from a manufacturer who uses it for cleaning up die cast end bells of small motors, — but that is only one example and the Vonnegut Brush-Backed Abrasive Head may be the answer to some of your difficult cleanup problems.

For further information write to,

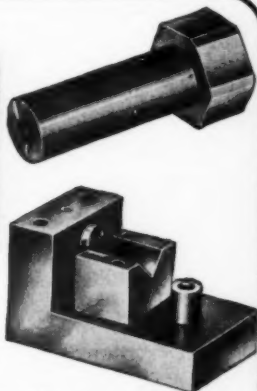
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**PROMPT
DELIVERY**

comparators in either bench or pedestal type, and in other styles to meet any possible need along optical projection lines.

A useful adjunct is a line of engineers' glass comparator charts and projection scales made for use in connection with optical comparators.

A really good comparator of the pointer and graduated scale type will in many instances replace special gages, and its possibilities along this line merit study in any shop equipped with one. In general, they lessen eye fatigue, because readings are given on a sufficiently large scale to be readily seen. One of these is provided with red mark limit hands to control tolerances that must be held, has fine adjustments for easy setting of the device, and has a measuring capacity of plus or minus .003", magnification being 1,000. Each small line on the scale of this instrument represents .0001".

In cases where optical glass flats are being used in determining the truth or flatness of surfaces, a light especially

adapted to the purpose is needed. Manufacturers of optical flats offer monochromatic lights with large, bright working fields. Inspection is claimed to be easy and fast, it being possible to see interference bands on relatively dull surfaces or thru air gaps of appreciable size. Using this light, it is not necessary to rub the glass flats down on the work, and it follows that wear on them is much reduced.

There are cases and places where close measurement or close inspection in the more ordinary sense of the term might call for nothing more elaborate than well-lighted magnification units. These have been pressed into service in many places. They incorporate suitably housed and protected magnifying lenses, mounted on universal arms, to permit placing in proper position over work-benches or tables. They incorporate lights that are properly directed. Such units are available in different models for different purposes, and bid fair to go far in various fields of service.

CIRCULAR SURFACE PLATES

A new round surface plate is announced by its manufacturer, Machine Products Corp., 6767 E. McNichols Road, Detroit 12, Mich. It measures 102" in diameter and was designed and built primarily for checking gun turrets. This 2½-ton plate, approximately 18½" in depth, follows the same unique design of rib construction that characterizes the other surface plates of this manufacturer, even to the 3-point bearing principle employed in the making of the steel fabricated base on which the plate must rest.

This and other sizes of round surface plates are being added to the company's catalog. All the plates are cast of Meehanite iron with the entire face precision scraped.

VLIER SPRING PLUNGERS

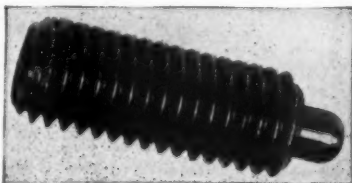
These new Spring Plungers are used as tooling and locating Pins. They break oil seals on dies and hold parts against permanent stops. They are manufactured by Vlier Mfg. Co., 4552 Beverly Blvd., Los Angeles 4, Cal.

The Spring Plungers are described as having uniform pressure for entire stroke; long plunger action and bearing; concentricity closely held and they have a rust-proof coating. The Plunger completely telescopes within the body.

They are made in three sizes, ½-13, ¾-16 and 1-20, with ¼, 3/16 and ⅜" plunger ends respectively.



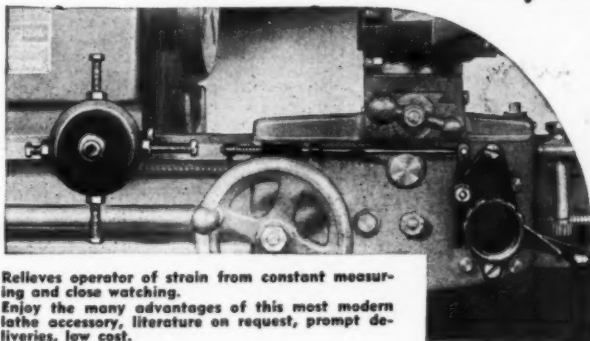
They are positive in action and are said to offer a marked saving in tooling overhead, due to their low cost.



The New



Automatic Feed Control for *Atlas* and *Logan* Lathes



Relieves operator of strain from constant measuring and close watching.
Enjoy the many advantages of this most modern lathe accessory, literature on request, prompt deliveries, low cost.

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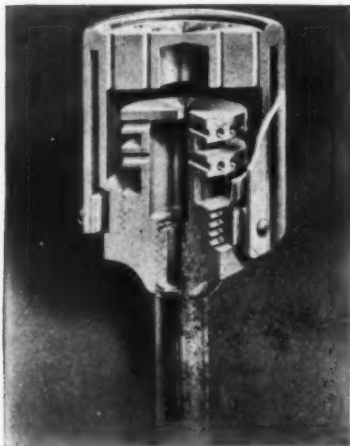
Easily machinable—easy on tools—increases tooling accuracy—holds threads without stripping. Non-corrosive—non-oxidizing—non-magnetic—spark-proof—does not require heat treatment—will not expand or contract. Tensile strength: 35,000 to 40,000 lbs. per sq. in.

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OSCAR W. HEDSTROM CORP. 4830 West Division St., Phone Columbus 3667, Chicago, 51, Ill.

MULTI-FLAME NOZZLES



A new heating nozzle, designed particularly for use with oxygen and the

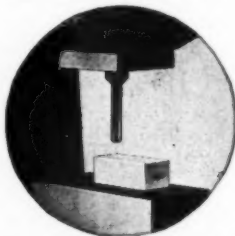
liquefied petroleum gases or natural gas, is now offered by Victor Equipment Co., 844 Folsom St., San Francisco 7, Cal. This heating nozzle fits all Standard Victor welding torch butts but can also be sold complete.

The design features of this particular nozzle incorporate an outer air mantle to protect nozzle head against deflected heat. Its internal design is such that the cool and pre-mixed gases carry away a substantial amount of accumulated heat, and in doing so become efficiently pre-heated for proper combustion. Similar multi-flame heating nozzles are also available in numerous sizes for use with oxy-acetylene.

The larger multi-flame heating nozzles are recommended for flame priming and descaling in inaccessible areas. All of them can be employed for various silver brazing operations, preheating and bending. Multi-flame nozzles are a most useful adjunct to all good welding torches.

ACME ANVIL BLOCKS

It is claimed that comparator anvils and anvils of similar measuring equipment can be protected against wear indefinitely thru use of the new Anti-Wear Anvil Blocks, a product of Acme Industrial Co., 210 N. Laflin St., Chicago 7, Ill.



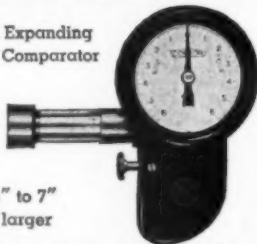
According to the manufacturer, the Block can be wrung to any flat anvil, (serrated or plain), and it will adhere firmly. Then, because work rests on Anvil Block instead of instrument anvil, the Block takes the wear, thus keeping instrument anvil free from wear indefinitely.

The manufacturer further says the new Blocks are lapped flat and parallel on all four sides to within a few millionths of an inch, and are made of hardened and seasoned gage block steel to assure accurate readings.

Standard size are $\frac{1}{2}$ " wide, $\frac{1}{2}$ " high, $1\frac{3}{8}$ " long, and are available from stock. Other sizes can be furnished to meet special requirements.

"Matched Gaging" to fractions of .0001" with COMTORPLUG

Patented Expanding Internal Comparator



Sizes: $\frac{1}{4}$ " to 7" dia. and larger

By combining high precision with unique simplicity, Comtorplug enables operators, bench inspectors and final inspectors to use the same gage, improving quality and lowering rejects. Shows actual size; detects out-of-round, front or back taper, barrel shape, bell mouth, etc.

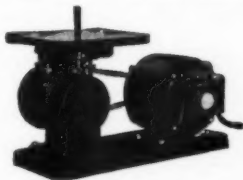
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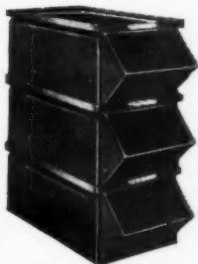
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NEW UNIVERSAL PRODUCTS

Universal Engineering Co., Frankenmuth, Mich., announces two new products—Grippets and Index Plungers, to their already well-known lines of collet chucks, boring bars and standard drill bushings.

It is claimed that Universal Grippets securely lock work in jigs and fixtures more quickly than with two-action setscrews and with less cost and trouble than with cams. They are complete, compact, single units ready to install.

Installation consists merely of drilling and tapping a hole in the jig or fixture and inserting the Grippet. No special adjustments are necessary. They are especially recommended for shops in which continuous, speedy handling of jig and fixture work is desired.

Universal Index Plungers are also used in jig and fixture work. It is claimed that they eliminate the expense of machining special indexing plungers for multi-station tools. Made in three standard sizes, Universal Plungers are complete and ready to be installed.

Features include (1) plunger assembly can be assembled from top or bottom and can be removed in either direction by removal of hex nut; (2) both plunger body



and taper bushings have same diameter. This simplifies manufacture of jig or fixture since all holes can be bored with the same size, and frequently with same setting and; (3) locating bushing, plunger and plunger bushing are hardened and ground for extreme accuracy.



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Plain Type**Offset Type****CONTINUOUS HINGES**

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

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SPECIFICATIONS:
Open Width $\frac{1}{8}$ " to 6"
Gage Material .040 to .125
Pin Diameter .101 to $\frac{1}{16}$
Lengths to 120"

THREE-FOURTHS OFFSET.

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No. 462
Electric



BAND SAW BRAZER

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Brazes
a Joint
as
good as
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The "OLIVER" is always ready for instant use. Easy and simple to operate, it gives uniform, controlled heat. The brazed joint is as strong as the saw itself. Economical . . . dependable and safe.

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**GREATER SPEED
and ACCURACY in
KEYWAY
CUTTING**

The
GLENNY
adjustable
expansion

**PUSH
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NEW Rouse HAND MILLER FOR SMALL PARTS

\$98

(Without Fixtures)
F. O. B. Chicago
Motor Extra



One of the ROUSE Fixture Set-Ups that
Speed Production

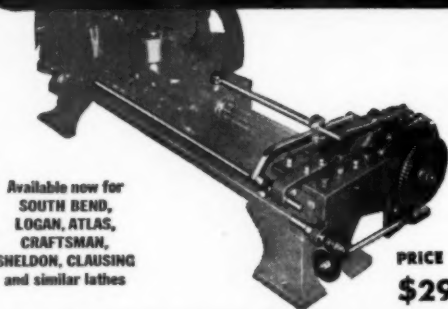
The Rouse Hand Miller is a versatile, efficient, high-speed ball bearing machine for handling light cuts in brass, aluminum and steel.

Rouse Fixture Set-Ups make the Rouse Hand Miller readily adaptable for accurately milling small parts for planes, radios, electric motors, and similar equipment. Spindle will take milling cutters or end mills.

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Newton AUTOMAT



Available now for
SOUTH BEND,
LOGAN, ATLAS,
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and similar lathes

PRICE
\$295

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• HERE is relief from manpower shortage and losses from rejects incurred by operator inexperience and fatigue—a practical, highly efficient means of greatly increasing output and profits, easily installed on any bench lathe. The unit is very simple in design and of rugged, enduring construction—as foolproof as a mechanical device can be. The set of standard cams will handle almost any job. The member which actuates the cross slide is a torque rod which cushions the shock of forming and cut-off operations, assures uniform feed and accurate repeating, prolongs tool life. An automatic cut-out, quickly adjustable to work of different character, reduces tool spoilage and parts rejection. A Schrader-engineered 3-way valve operates any collet closer. Put this easily installed, money-making unit to work for you now. It will pay its cost in less than 30 days!

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PRECISION GAGES

When we speak of precision gages, we use a rather general term that includes a tremendous territory. There have been many advancements along this line in recent years.

One of these is the increasing recognition given to the aspect of wear, as it touches a precision gage. In any solid type of gage, when a bit of wear has occurred, the precision is gone until the size of the gage has been restored. This has been done thru plating and grinding. A more interesting angle is prevention of wear thru use of gages made with tungsten carbide wearing surfaces. These are

are of doubtful skill.

If you have many precision instruments and gages to set, and have been doing it by using clamps and parallels, in connection with gage blocks, you may be interested to know that a special internal setting gage has been developed for this purpose.

It has a pair of gaging surfaces that are finished to millionths in flatness. One of these is adjustable with regard to the other, the adjustable one being directly above the fixed one. But adjustments are not often necessary.

The internal setting gage is kept at a fairly large setting.

noted for their sustained accuracy.

Have you ever seen a snap gage for thread measurement in use? One manufacturer of taps and dies, uses snap thread gages, with gaging points instead of buttons, for checking the pitch diameters of the threaded test plugs used on their dies. If the test plugs are at a high degree of accuracy, the same will be true of dies found to be in close agreement with them.

There is another type of snap gage which has become quite popular. That is one designed to incorporate a dial indicator, to speed inspection. There is always a brief period which the user of the standard snap gage loses, while he "feels out" the work with the gage. With the snap gage fitted with a dial indicator, an accurate reading is obtained, and the process is speeded. These are also especially valuable where inspectors

MEET ONE A CHAMPION

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Twelve Champion Expanding Mandrels will do the job of hundreds of solid mandrels . . . completely and accurately filling any hole from $\frac{1}{8}$ " to $6\frac{1}{2}$ ".

The flexible round sleeve on the tapered arbor automatically sizes to the most minute variation. Save time and reduce costs with Champion Expanding Mandrels.



The Only Mandrel That Completely and Accurately Fills the Hole.

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To obtain greater output, save time, perform work easier, requires the right clamp for every job. In design and construction, HARGRAVE Clamps have kept steady pace with production needs of industry. Write for catalog showing complete line of Clamps, Chisels, Punches, Washer Cutters, File Cleaners, etc.



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**SEND \$1.00 FOR
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The only Pyralin Mallet on the market with threaded tips replaceable by hand. Plastic tips are quickly and easily screwed into the solid "non-sparking, non-magnetic alloy heads" when replacements become necessary.

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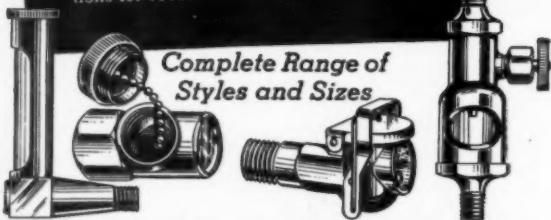
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These gauges, which only suggest the wide range of styles and sizes available in the Gits complete line of lubricating devices, are dictated of actual field requirements. They are ruggedly produced from solid brass stock and drilled to provide a generous oil passage. Catalog No. 60 illustrates and fully describes these and every conceivable type of lubricating device—write for your copy, or if you have a specific problem, send your specifications for recommendations.

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RECESSES

Metal parts with recesses machined into them have various troublesome aspects. One of these is the machining itself. It is interesting to observe methods used by different manufacturers of automatic screw machines for the recessing of parts, while they are being produced.

One of the oldest and most time-honored devices for the purpose, much used on one standard line of automatic screw machines of single-spindle type, is the so-called swing tool. These tools are made with a swinging arm, arranged to hold the recessing cutter. The swing tool is

held in the turret of the machine, and the pivot on which the arm swings is at the top of the arm. Normally, the arm has a position that allows the cutter to clear the hole already machined in the end of the work.

After the tool has entered the hole to the proper depth, the swinging arm is actuated by a fixed or adjustable guide, swinging it to engage the interior wall of the hole, and make a recessing cut. A great many screw machine products are recessed in this way.

An interesting proposition in recessing is sometimes found in the making of special gear elements. One firm developed a special mechanism that has particular reference to the recessing of gear teeth, used in various transmission elements.

Used on a gear chamfering machine, the mechanism will recess intermittent teeth, on either internal or

external gears. An end-milling type of cutter is used for recessing, and a cam carries the gear to and from the cutter, relative to the intermittent turning movement of the gear, to recess the teeth as pre-determined. Recesses made in this case are not undercuts, however, as recesses often are.

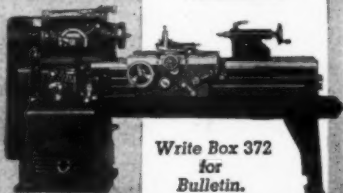
There are many recesses which present difficulties in inspection, if and when it is considered necessary to examine them. However, special industrial telescopes have been developed for the inspection of various hard-to-get-at places, which allow one to inspect them.



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AND
JAMIESON
LATHES
15" AND 16"**

12 Speed Geared
Head Motor Drive
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Modern Design—
Liberal
Dimensions.



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Make Fast Work of Small Jobs

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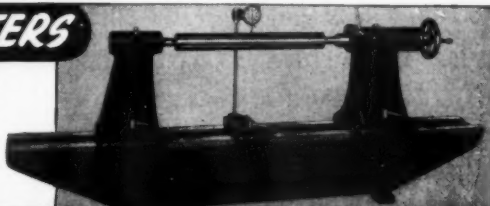
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Removable Centers are tool
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Equipped with screw tail-
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RANGE OF DIAMETERS: FROM 1/4"
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FACE WIDTH FROM 1/8" TO 2";
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Ideal for fine precision drilling and maintained accuracy, the Sigourney M-100 has sealed ball bearings throughout . . . hardened and ground spindles . . . Standard Machine operates at speeds from 4,000 to 10,000 R.P.M.; other speed ranges available . . . manufactured in 1, 2, 3 and 4 spindle models.

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VICES

So many types of vises are in use in various shops that one cannot help thinking how convenient the vise Jones has would be in the shop of Smith, and vice versa. Some vise designs were doubtless born in the minds of individual mechanics having need for just these particular types.

The tool maker needing a vise one minute, and a V-block the next, and continually changing from one to another, may have been the man who thought of making a toolmaker's vise with a V-groove machined into the under side of

the base. This was done in such fashion that simply turning the vise over on the machine table provided the V-block. Such vises are provided by some makers of small tools. Very similar vises without any V-groove in the under side of the base, however, are also available.

Where plain vises are used on production work, they are made larger in size and provided with larger and more powerful clamping arrangements. Some have holes passing thru them from top to bottom, to make it easy to clamp and hold them on platens or fixtures.

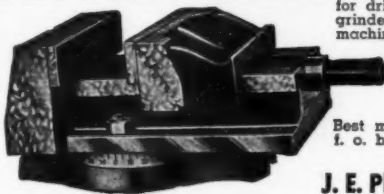
Others are provided with flanges, used to clamp them in place on tables of milling and other machines. One vise of this kind has the flanges so arranged as to return any coolant being used, to table channels.

Some vises have been designed with particular reference to handling of the many different shapes that come to the milling machine, the drill press, etc., without the operator taking time to locate various bolts, clamps and angle plates necessary for making proper setups. One such has a revolving jaw of four-side type, and with it can be used supplementary jaws, which make the unit versatile. In shops where many small jobs of various shapes frequently come to hand, such units are particularly valuable as time savers.

Now on the market are special machine table vises which speed operations greatly.



PLUNKET IMPROVED VISES



We make a complete line of modern vises for drill presses, shapers, milling machines and grinders. Illustration shows our standard milling machine vise as regularly furnished and stocked.

In ordering this vise give size of slot in table:

No. 10—6" jaws, 1½" deep, opens 5",
wt. 45 lbs. \$38.00

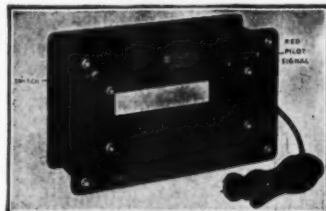
No. 20—10" jaws, 2½" deep, opens 8½",
wt. 120 lbs. 52.00

Best material and workmanship. Prices are net f. o. b. Chicago. Dealers' inquiries are solicited.

Write for folder TODAY.

J. E. Plunket Machine Co., 1823 W. LAKE ST.
CHICAGO 12, ILL.

AMC DEMAGNETIZER A TOOL ROOM NECESSITY



Every tool room needs this simple, portable, sturdy demagnetizer. Small parts passed through the powerful AMC field are instantly demagnetized. Large, flat surfaces can be demagnetized by sliding the device over the surface.

Price is only \$32.50, complete as shown.

Write for full information.

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Headquarters for Standardized Die Sets, embodying many exclusive features and embracing more than 195,000 stock sizes and 46 different styles. A die set that is unsurpassed. Let us prove it!

Send for our new 336 Page Catalog.

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Actual Size Photo
3 Grad Size—Common
1/4" Shank—\$12.50 ea.

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- **RE-SET-ABLE** adds to life of your diamond ... More work per carat. Exclusive patented setting is tender to the diamond ... Holds firmly ... Protects from damage ... Guards against breakage.
- No. 24 **CN RE-SET-ABLES** are now selling in 100 lots. Ask for easy No. 4 Catalog and Grinder's Instruction Card. Shows sizes to fit your machines. Tools backed by service unequalled.

All diamonds are **LOC-KEY-SET** for immediate shipment ... Tools numbered in units of 1/4 carat (No. 1 size) and lettered to denote quality of diamond and style of mounting ... 3 grades—Common (C), Medium (M), Select (S). (24-hour resetting service \$1.00 postpaid.) Bigger stones in C grade are genuine economy in diamond use. For large wheels we recommend No. 60-CN.

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Precision Grinding
Production Line

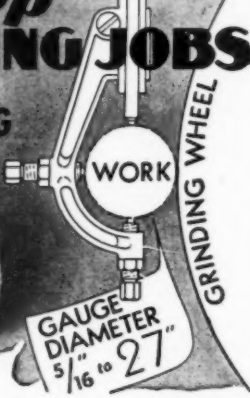


DIAMOND TOOL COMPANY, Not Inc. 938 E. 41st Street CHICAGO 13, ILL.

Speed Up GRINDING JOBS

With Automatic
DIAMETER INSPECTING
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DURING
GRINDING



Pratt Grinding Gauges caliper external cylindrical jobs while work is in motion or at rest. Adapted to straight or tapered work. Tolerances of .0001" plus or minus easily maintained. Visible check on out of roundness, rough grinding and chatter. Cannot grind work undersize unknowingly. Easily installed on any grinder. Pratt Grinding Gauges increase production, eliminate scrap and assure accuracy. A modern precision tool, ruggedly built.

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GRINDING WHEEL DRESSERS

The use of diamond wheel dressers has increased greatly of late years, compared to the employment of other kinds of wheel dressing tools. This is partly due to improved methods and facilities for setting diamonds.

Also, the very fact that there is an increase in their use has lowered their price, for when any tool can be marketed in sizable lots, it makes the labor costs on production much less.

Some diamond pointed wheel dressers have been selling for unbelievably low prices recently, and satisfaction with the

tools is fully guaranteed. This is the type of tool with an ordinary handle, designed for free-hand use against the wheel.

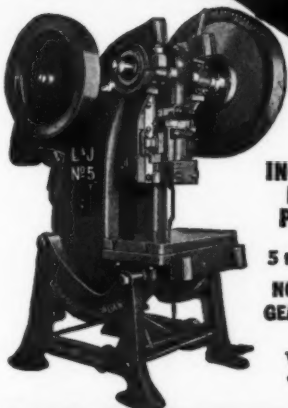
Wheel dressers that contain a number of relatively small diamonds set into a matrix are also comparatively low in price. One such contains 11 separate diamonds, arranged in three rows in the matrix. It is suitable not only for general toolroom wheel dressing, but also on relatively small cylindrical and surface grinding wheels, on production. The diamonds are precisely spaced in the matrix.

Some of the standard grinding machines require diamond dressing tools with specific types of nibs. In this case, manufacturers of diamond dressing tools have the necessary data, and will supply the proper nib to fit any standard machine.

Some manufacturers of tungsten carbide tools also supply diamond dressing tools. In fact, there has to be a definite combination of tungsten carbide and diamonds in some dressing tools, for there are some that set diamonds in sintered tungsten carbide in manufacturing wheel dressers. Others use special alloys, which will hold the diamonds firmly, until they are fully used up.

Other methods of holding diamonds more firmly in dressing tools have been developed. One of these involves holding the diamond in a slug, and then locking the slug tightly to the nib with a special, internal key construction. Good diamond dressing tools are really indispensable.

Standard Since 1911



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in 1**



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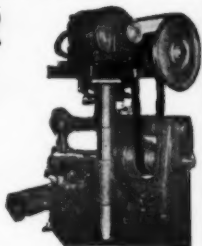
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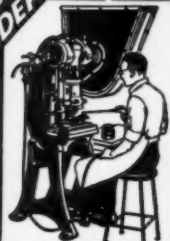
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ELECTRO-PLATING

Motor-generator sets designed with particular reference to electro-plating and other electrolytic processes are in use in a wide range of sizes, some of them having a capacity of only $\frac{1}{2}$ Kw. Sizes of $\frac{1}{2}$ to 250 Kw, 100 to 40,000 amperes, 6 to 60 volts, are provided by firms specializing in this line. Both self-excited and separately-excited types are furnished.

On the other hand, electronic electro-plating rectifiers are sometimes used as sources of direct current, and may be obtained from several firms making different kinds of electro-plating equipment.

A line of copper oxide, plate type rectifiers provides a practical means of converting alternating current into direct current, suitable for use in electro-plating.

These latter devices give their best performance when they are installed in places where the air is not allowed to become excessively humid or dirty. Plants with suitable air conditioning systems can, therefore, benefit most by their use, for there they will give years of trouble-free service. There are no moving parts involved in the rectifiers, except for small ventilating fans, which provide air circulation.

For plating small articles, the setup is sometimes quite different than where relatively large parts are being handled. There is, for instance, a line of electro-plating machines which are often used for plating small parts. These embody a steel tank that is rubber-lined, for holding the solution, the anodes, rods and connections.

The parts to be plated are contained in a perforated and insulated cylinder, provided with negative and insulated conductors.

Some of these machines are driven by belt and others by motor directly. The machine frame has a four-point contact, and this is placed in the bottom of the container in such manner that the electric current is equally distributed to all items in process of plating. Very uniform deposition is obtained. Scrap anodes can be used up.



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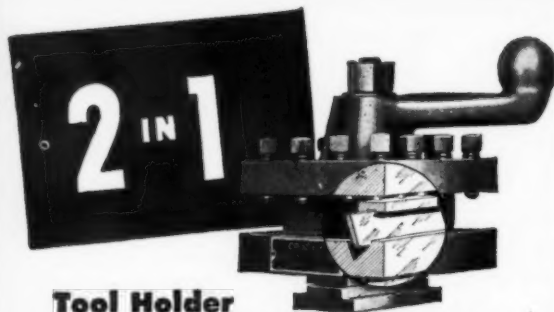


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Tool Holder and Cut-off Bit included with the Crozier Tool Post Turret at NO ADDITIONAL CHARGE!

Standard equipment with the accurate, high quality Crozier Tool Post Turret now is a specially designed holder and a high speed steel cut-off bit—at *no extra charge!* Not only is this exclusive feature (Patent Applied For) an immediate money-saver, it also increases production, provides more rigid tool support and reduces set-up time. The Crozier Tool Post Turret, the first to be made for bench lathes, retains its normal advantages of fast, close indexing, dependable accuracy and long life which have made it so popular. It is available for Small, Medium and Big lathes—with cut-off holder and bit *without additional cost, remember.* Write for details.

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Successors to C-W-C Corporation

See Crozier Products at National Metal Congress, Cleveland, October 16th to 20th

SURFACE GRINDERS

In those surface grinding jobs involving only a few and relatively small pieces, at a given setup, it is a point in production strategy to route them to a hand feed machine. This must be small enough to be consistent with work being handled, and must offer facilities for fast set-ups. It reduces the time required for changing from one job to another, and results in a greater volume of work being performed, without working the grinder operator any harder.

One little machine that will handle a grinding area of 6x18" is available, and has proven particularly efficient in this

respect.

Another similar machine is especially efficient for the surface grinding of small machine parts, and of tools and dies.

In a number of plants, where there is not sufficient tool room work to keep toolroom grinders at hand continually employed, a machine of this kind can be set aside for given intervals of time, to work on production.

Where this is done, however, either the toolroom foreman or the production foreman should have first choice continually. This should be understood, so there will be no arguments arising, as to who shall have the right to the machine, if it chances to be needed by both at the same time.

A handy little surface grinder used in many plants during the last few years has the motor directly mounted on the ball bearing spindle, and has a hydraulic table feed that is infinitely variable as to its speed. The hydraulic method of feeding the tables of surface grinders provides a very smooth advance. In consequence, there is no roughness in the grinding, resulting from chatter in the table feed.

Have you ever noticed little bench-type surface grinders equipped with a magnetic chuck of permanent type operating on very small work? On work where there is no very heavy pull involved, the permanent type of magnetic chuck often is superior to the electromagnetic chuck, for there are no wires or generators involved.

Have you ever noticed little bench-type surface grinders equipped with a magnetic chuck of permanent type operating on very small work? On work where there is no very heavy pull involved, the permanent type of magnetic chuck often is superior to the electromagnetic chuck, for there are no wires or generators involved.

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We are now in position to take on some additional work. Our plant is ultra-modern with finest equipment. Our staff has had more than 34 years of experience in management, engineering, designing and production—skilled in handling war contracts for large firms—quickly and efficiently.

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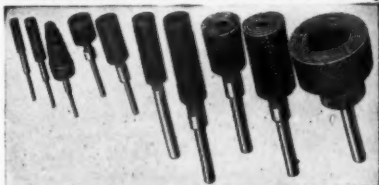
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De-Sta-Co spacers save a lot of time when setting milling machine cutters . . . they do away with much idle machine time and thus increase production . . . they are offered in all standard arbor sizes and in thicknesses from .001" up, including long spacers cut from bar stock and ground to decimal . . . they are made from metal and therefore are not affected by temperature changes . . . they may be used over and over again, which makes them the lowest in cost of any arbor spacers you can buy.

SEND \$1.00, giving us size of your arbor, and we will send you a special trial assortment of spacers, sufficient for average use on a machine.

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Established Over 25 Years
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PICKLING OPERATIONS

Removing dirt, corrosion and scale from metal by the pickling process, does not ordinarily contemplate the use of electricity. It is a fact that a special process of electro-chemical descaling of metals has been developed, and is profitably used in many places.

It is difficult to say to what extent it will gain and hold ground industrially, as compared to standard pickling processes. But it is a fact that the pickling process, as we have known it in the past, has been subjected to a number of improvements.

In some places, a special so-called pickle

bath toner in either liquid or powder form is used. This is claimed to improve the effect of a pickling or stripping bath very definitely. Better wetting of the material is said to result, and better and smoother surfaces are obtained. It is claimed that relatively light films of oil are removed, and that there is the formation of a thin, flame retaining blanket.

Pickling tanks are made of various materials, best calculated to withstand action of the heated sulphuric acid used. Many are made of wood, cy-press being preferable for the purpose. Tie rods, nuts and washers used for bolting such tanks together, are usually of brass, bronze, or Monel metal.

Some wooden pickling tanks are lined with lead or rubber. One style of tank recently developed, and especially good, in that it will not leak, corrode, or disintegrate, is unaffected

by rapid temperature changes, or by operating temperatures up to 265 degrees F. It is made of a special molded phenolic resin asbestos composition.

An interesting angle in some places is getting rid of waste sulphuric pickling liquor. This has at times become a problem. One firm installed a large outdoor tank, and piped their waste pickling liquor to this tank for evaporation.

The tank was made of steel, then lined with special laminated rubber. The lining was made of a layer of hard rubber, vulcanized between two layers of soft rubber, and a lining of brick sheathing.

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FOR CENTER DRILLING AND MILLING

Do away with guess work on cross center drilling of round or hexagon stock. No moving parts are involved, guaranteeing accuracy. Bushings are interchangeable giving wide range in hole sizes. Vise is equipped with $\frac{1}{4}$ " drill bushing. Since all surfaces are precision ground it can be used with any type of machine tool as a work holder and permanent accuracy is assured. Has V block with opposing jaw for unobstructed work. See your dealer or write us today.



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The lowest-priced wire and rod cutter on the market. The hardened cutters last indefinitely.

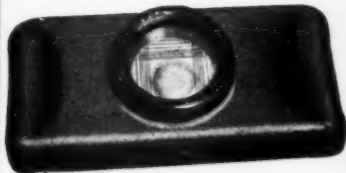
Hand operated. A giant for work, cuts wire and rods up to $\frac{5}{8}$ -in. round or $\frac{3}{4}$ -in. square and band iron up to $\frac{1}{2}$ in. by 2-in. Adjustable stop for repeated cuts to same length. Large or small, your shop can use a WONDER CUTTER.

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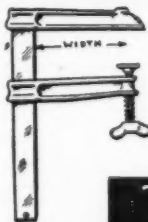


A precision "all-way" level for use in machine tool building, setting up and maintenance, whether for establishment of level working surfaces or for the accurate checking of straightness where true level itself is not required.

Graduations are in .0005" per foot and form squares about a circular bubble, thus giving coordinate readings and showing the direction and amount of slope, if any. Made in two sizes— $5\frac{1}{2} \times 12$; $3\frac{1}{2} \times 6$ ".

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were cut from the famous Cullinan Diamond, they would be "worth a million" apiece — but no more finely finished than they are in the hardened gage steel which United Precision uses.

Tolerances to .00002" (One two-hundred-thousandths of an inch. Sizes .030" to 1.000".

UPPCO-Lapped by United Precision's exclusive process for finish. Chromium-plated if desired.



Two "Go's" and two "No Go's" in one gage handle.

"Go" and "No Go" plugs are in the same handsome hexagon handle. Each plug is reversible. Reverse either plug when worn, and you have a brand new gage. Change made in a moment. Double accuracy life, double saving of time.

United Precision PIN GAGE SETS complete in cabinets.

Number Drill sizes: 1 to 60; Letter Drill sizes A to Z. 86 pins in one cabinet. Fractionals: 1/64" to 1". 64 pins in one cabinet.

Manufacturers of other plain plug gages of A.G. Design. Ask for catalog. Wire or write.

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GEAR FINISHING

The task of gear finishing has two different aspects. One of these is the actual correction of tooth form. This is most important, of course, so far as the running qualities of the gears are concerned.

The other aspect is the chamfering and burring of the gear teeth at their extremities. The latter is quite a subject, and much ingenuity has been displayed in the design of machinery for the purpose.

One manufacturer of various gear machines has produced a unit devised for burring internal gears and splines. Another unit made by him makes use of two

separate fly cutters, carried on separate spindles, to remove the burrs from both ends of the gear teeth at the same time. The gear being chamfered and burred revolves also, the action being somewhat similar to that of a gear hobbing machine, but much faster.

Another somewhat similar machine is designed for burring and chamfering spiral bevel and hypoid gears.

Some gears are necessarily made with great care, and are later subjected to a lapping operation for a finish. In one lapping machine, three laps of toothed type are run in mesh with the gear being lapped, a fine Carborundum abrasive being used, with oil, as a lapping medium.

Tho the three toothed laps are all of equal diameter, they are provided with different numbers of teeth, so

that the pitch line contact on each one is different.

Brakes are provided on the lap spindles, so that a resistance load can be thrown on each, as best suited to the work in hand. An end motion is given the gear being lapped as it rotates. The gear being lapped is driven by the lapping machine, and it in turn is forced to drive the three resisting laps, radially disposed around it.

Gear tooth grinding, as a means of producing a highly accurate final tooth form, has been in use possibly 25 or 30 years, and the process still has a great many friends.

**"ROCKWELL"
HARDNESS TESTER**



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These Enormously Improved
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both 29° and 60°
THREAD TOOL BITS

Accuracy, uniformity, and precision are
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tool bits, with or without rake on the
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Fixture can be easily clamped to work
table when magnetic chuck is not
available.

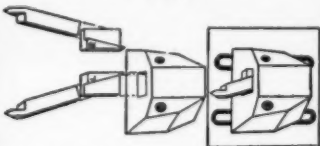


Diagram shows how to grind 15° right
and left hand bent tools with standard
adapters.

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3/8	7	3/16	P61R, P62R, P64R
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CLARK



CUTTERS

Robert H. Clark Company

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HARDNESS TESTING

This important phase of metal-working operations is assuming many ramifications as the years pass. There are firms engaged in making hardness testing instruments, which have gradually built up lines including various types.

Some of these are direct reading. Some are of conveyor and automatic types. Some operate by hand and others by power. Hardness testers are made in all sizes and for all purposes.

One hardness tester is operated by a foot pedal. One simply inserts the piece to be tested, presses the pedal, and then reads the Brinell hardness number right



The exclusive Clark Lever-Lock securely grips the tool bit.

on an incorporated depth dial indicator gage.

Rough pieces can be tested without prior buffing or grinding, and the use of a glass for reading is never necessary. There are also some diamond type hardness testers in this same line of instruments.

The use of diamonds in hardness testers has become a widely established practice, and many prefer diamond type instruments. It is to be expected, therefore, that companies dealing in industrial diamonds will supply such as are suitable for this purpose. Therefore, the manufacturer of hardness testers has no trouble obtaining diamonds.

Portable hardness testers are in use in some plants, which employ hydraulic pressure to apply the load to a ball. This is a small unit, it puts

a load of 3,000 kg on a 10 mm ball. It can be used in any position, even tho it be upside down, and has been found especially suitable for armor plate work, castings and forgings.

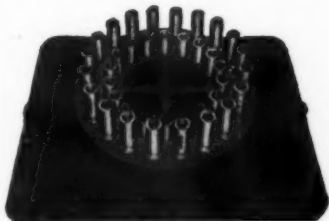
The head of the instrument is brought down by means of a hand crank to make contact with the work, after which a control valve is closed and a pump lever operated. This builds up hydraulic pressure, until an incorporated dial indicates an applied load anywhere from 250 to 3,000 kg as predetermined. There is a relief valve incorporated, also, which opens at the set load, preventing the proper pressure being exceeded.

New Britain UNIVERSAL VISE THE ORIGINAL

Swivels 360 degrees horizontally,
100 degrees vertically, to
give any angle or com-
pound of
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Pictured: a 38-Spindle Heavy-Duty
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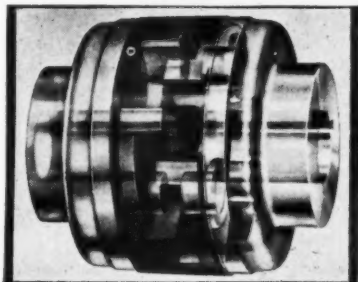
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THREE UNIT SAFETY SMOOTH DESIGN

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205 Illustrations

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PLEASE PRINT

INDICATORS

As a general rule, a precision indicator that will read three ways is not needed, but such may be obtained and there are some cases in which they are convenient.

One of these, designed for machine and tool work, and quick set-ups, has a feeler that is mounted in centered cone bearings. It is highly accurate, regardless of direction of the reading.

Dial indicators are provided by most manufacturers of gages and related devices. In some cases, they are built for the seller by another manufacturer, that specializes particularly in this kind of



work. The better dial indicators are made rust-proof thruout. Some of the cases are die castings of bronze alloy, with the supporting stems of the cases integrally cast.

Dial indicators are made in a number of sizes, and in different ways by various manufacturers. One type of instrument having a so-called balanced dial will give readings either plus or minus, to the right or the left of a zero line, respectively.

Others are provided with a continuous dial. This kind of dial is employed where long travel of the movement in one direction is required.

Did you know that indicators with continuous dials sometimes have a spindle travel as great as one inch?

In testing long tapers, and in extensometer work, indicators with a long range of spindle travel are especially convenient. Those with a spindle travel of $\frac{1}{2}$, $\frac{3}{4}$, and 1", respectively, are obtained readily.

Some have small dials incorporated on the faces of the larger dials, to prevent any confusion in reading. The large hand makes a number of turns over the dial in connection with a long spindle travel. There is a small hand on the small dial, which gives a direct reading as to how many turns the large hand has made, just as the hour hand on a clock travels from numeral to numeral while the minute hand makes a full revolution. Instruments with either plain or jewel bearings may be had.



STANDARD D-4 Abrasive Band Grinder

This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36 1/4" band. The ideal portable unit.

OTHER STYLES AND SIZES IN NEW
MANUAL ON FINISHING—WRITE TODAY

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"TRU-V" BLOCKS



Why Not Save Time—by having enough V-Blocks available at all times in your shop to avoid the delays involved in make-shift set-ups and tie-ups?

"TRU-V" Cast-Iron Blocks are available in nine sizes—from 3 1/2" to 10", in three styles. Each block is carefully machined on all sides, with close limits held within .001" where required. A machined ledge on both sides provides for clamping on machine bed.

Let us send descriptive bulletin.
Or contact your mill supply dealer.

Oliver Motorcraft Corp.
2532 S. Wabash Ave., Chicago, Ill.



Alnor

WALL PYROMETER • Type 1705

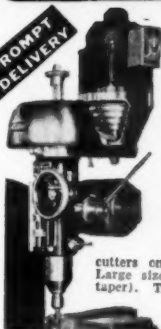
Alnor Type 1705 is a dependable pyrometer of moderate cost, built for heavy duty service with heat treating and annealing furnaces, kilns, ovens, melting pots, galvanizing vats, plastic molding and similar equipment. Furnished with standard thermocouple and alloy extension wires. Various standard ranges, 0 to 400 deg. F., to 0 to 3000 deg. F. Thermocouples can be equipped with protection tubes for continuous high temperature service, or in corrosive atmospheres.

Write for Pyrometer Bulletin giving complete data.

ILLINOIS TESTING LABORATORIES, INC.
420 NORTH LA SALLE STREET
CHICAGO 10, ILLINOIS

MILLING - DRILLING - BORING ATTACHMENT for Heavy Duty Operations

PROMPT
DELIVERY



Easy Mounting

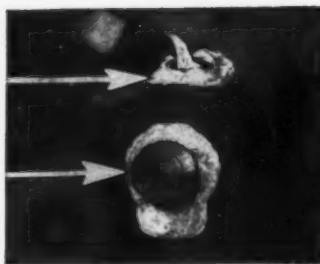
Large Quill —
4" travel
counter balanced,
hardened, and
ground
6 speeds
250 - 3000 RPM
Lever and Worm
Feeds

1/2 H.P. Motor

Specially engineered by RUSNOK to meet the demand for heavier duty end mill operations. Uses many types of cutters on a wide range of work. Large size spindle (No. 9 B & S taper). Takes 1/16" to 3/4" end mills. Precision Engineered and Ruggedly Constructed Throughout.

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RUSNOK TOOL WORKS
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No Time Lost... Bearings Poured with Babbittite!

- Babbittite—the safe babbitt retainer—never blows out—contains no moisture to generate steam.
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- Babbittite “sticks tight” to mold or journal under all working conditions.
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- Babbittite requires no mixing, is always ready for use, may be re-used over 100 times.

Babbittite has other uses in Casting, Heat-Treating, Finishing. Write for Literature and Liberal Sample.

Babbittite
THE BABBIT RETAINER

PRODUCTS MFG. CO.

509 E. BUFFALO STREET
MILWAUKEE 2, WIS.

GEAR-TYPE FLEXIBLE COUPLINGS

Among the various types of flexible couplings which have proven practical and adaptable, there are several which incorporate elements of gear type.

A very interesting coupling of this class really has three such elements. The one which compensates for misalignment is an internal sleeve. This sleeve is cut at one end with internal gear teeth, which fit over a spur gear member held on one of the two parts to be connected. The spur gear member is large enough to completely fill the internal gear teeth in the sleeve, in the sense that one cannot

rotate unless both rotate together and in the same direction. However, they are fitted sufficiently loose that the sleeve can have a rocking motion, to compensate for misalignment as already mentioned.

The opposite end of the internal sleeve is cut with external or spur gear teeth, and these engage, in like manner, internal teeth that are cut in a flanged covering sleeve. The flange in the covering sleeve is incorporated in order that it may be provided with holes, thru which it may be bolted to a brake drum, to a flywheel, to another mechanical flange, etc.

The coupling is also adaptable for connecting two free-ended shafts, by fitting one of the shafts with a mating flange, to connect to the flange of the coupling.

The arrangement makes it possible to readily and flexibly connect the

ends of two shafts which differ in diameter, so the device is highly versatile.

One flexible coupling provides for parallel misalignment by means of four, meshing, gear-sector members, and the design is such as to eliminate the lateral thrust of a shaft. The gear-sector members carry protruding pins, and on these pins are mounted rollers, this making up the one half of the flexible coupling.

The other half of the coupling is a hubbed member to attach to the other shaft, and is provided with a very heavy flange. On this are machined four spherical pockets into which the rollers fit.

PRECISION MACHINE VISES



All Perkins Swivel Vises swing 360 degrees and have complete circle graduations

All Angle Vises raise 92 degrees

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MILLER-KNUTH MFG. CO. OMAHA, NEB.

This... HIGH - SPEED PRECISION DRILL PRESS

Size Range .004"-.125"

Gives You

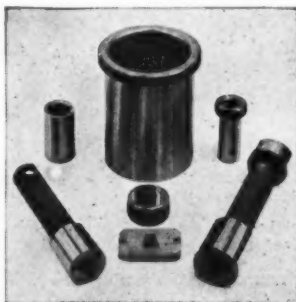
- Continuous speed control 1,000 to 10,000 R.P.M.
- No vibration
- Minimum drill breakage
- Immediate delivery

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Circular



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THE manufacture of Drill Jig Bushings and the manufacture of Gages are so closely related that Economy Tool has found it most practical to specialize in the production of both.

This kind of a set-up also enables us to manufacture various other hardened and ground precision parts, including Centerless Grinding and Super-finishing, in limited quantities.

Experience through the years tells us that your job can be no better than the tools applied in the making. Your production standards are high for a reason. Nothing will suffice unless it meets specifications exactly as you prescribe them.

Precision, therefore, has become a law to us. Tools are made to keep you at top production with minimum cost.

Write today for particulars

ECONOMY TOOL & MACHINE CO. MILWAUKEE 14, WIS.



CRITERION *Boring Heads*

Original Accuracy *Maintained*

Lead
Screw
ground from
Solid AFTER
hardening.

Noted for maintaining original accuracy over a longer period Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. Lead screw is hardened tool steel, with threads ground from solid after hardening. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.



C

CRITERION MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

MILLING MACHINE CUTTERS

The manufacture of milling cutters has become a science, with the result that the metal-working shop can accomplish many remarkable results along many different lines with the milling machines, if the units are in good condition.

The shearing-cut principle has prevented much of the chattering formerly experienced, and good spiral-toothed cutters are now standard, to the extent that certain manufacturers make all cutters, having ¾" faces or more, with spiral teeth.

Altho there are many manufacturers

making cutters of ¾" face and less with straight teeth, there is one way in which a shearing cut has been obtained by many, even with narrow-face cutters.

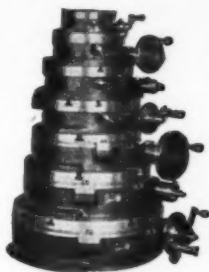
At least one manufacturer is providing such cutters with a curved tooth form. This is not a spiral tooth, but is one in which the center-width of the tooth edge contacts a flat surface first, and from that point the tooth form recedes on both sides. This arrangement provides more cutting edge, yet the tools are quite easy to sharpen, and will cut a great deal faster than straight-toothed cutters. Woodruff keyway cutters of this kind are also available.

Milling saws have little application in some shops, but in others they are exceedingly important. Forward strides have been

made in the manufacture of such saws, with particular reference to the way the chip is formed, carried and discharged. The teeth of a milling saw have less chance to clear themselves quickly than the teeth of most other milling cutters.

It, therefore, becomes important to provide for the chips to be carried, without jamming up in the saw gullets. To provide for this, one line of saw blades has gullets ground with a special rounding form. The point of the tooth is pitched forward sufficiently to get under the chip, and start it curling in the process of formation.

TROYKE ROTARY TABLES



Sizes 9", 12", 15" and 18".
Ask your dealer or write us for
eight page catalog.

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NIELSEN Heavy Duty

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Adapted
for heavy
duty work.
Precision type
ball and roller
bearings assure
maximum capac-
ity for high speed
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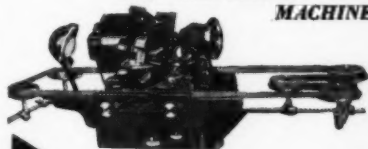
RECONDITION

YOUR OLD SAW BLADES

HERE IS A NEW

SAW SALVAGING

MACHINE



THE HOWE-LINDSEY AUTOMATIC
SAW SHARPENER

*Save... Time . Money and
Critical Materials*

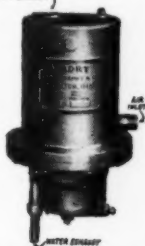
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WATER removed from AIRLINES AUTOMATICALLY WITH THE MURPHY SEPARATOR

AIR OUTLET

There is No
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That We Cannot
Correct and
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Remedy.



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Sizes 1/2" to 4" Pipe

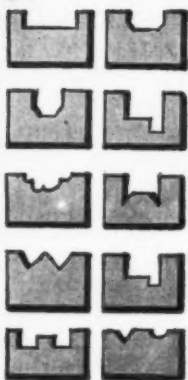
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RESULTS — — — GUARANTEED
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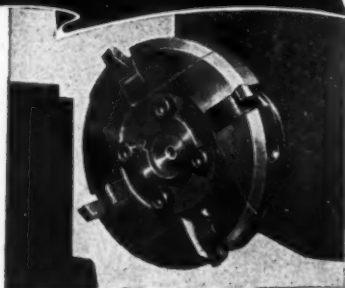
JAS. A. MURPHY & CO.

HAMILTON, OHIO

Newfield UNIVERSAL FLY CUTTER



Above—a few of the many cuts that can be made with the Newfield Universal Fly Cutter in ONE operation on a horizontal or vertical mill or drill press. Individually adjustable bit holders permit slots of any shape to be cut 3/16" to 1-1/2" wide.



Above: FACE MILLING

STANDARD BITS MAKE 4 TO 6 DIFFERENT CUTS IN 1 OPERATION!

For many types of milling, light metals and plastics as well as steel, there is no longer need for special cutters. A single Newfield Universal Fly Cutter, utilizing any type of standard high speed steel or carbide bits, makes multiple cuts in one operation. In contrast with expensive specially ground cutters, the standard bits used in the Newfield are easily and quickly ground in your own shop, readily replaced or reground for other work, at small cost. There is practically no down-time if a bit is broken.

The Newfield fits all standard arbors, turns to any required speed for fly cutting, slotting, surface and straddle milling, gear cutting, disc and gasket cutting. Standard sizes are 4", 6", 8", 10". Write for details of this versatile, production-upping, money-saving tool.

NEWFIELD MACHINED PARTS COMPANY

7160 Melrose Avenue, Los Angeles 46, California

TAPERS

While an occasional moderate amount of taper on one or two pieces may be machined by setting a lathe tailstock over in relation to the ways, most lathe manufacturers can now furnish good taper turning attachments for their machines. This simplifies the work greatly, and produces better tapered turnings.

One taper turning attachment, applied to a line of modern lathes, contains 24 permanently sealed ball bearings, riding on hardened and ground steel ways, to produce the taper.

This reduces friction to an absolute

minimum, and insures that only a minimum of wear will occur, so that accuracy will be maintained. The bearings are all concealed, so they are never exposed to chips or dirt.

One lathe builder has developed a tapering attachment which incorporates a telescopic feature. The telescopic arrangement makes it unnecessary to disconnect the crossfeed screw when the taper is in use. This attachment, used for boring, as well as taper turning, handles tapers up to 3 1/2" per foot, very smoothly and accurately.

A taper-turning attachment as found on one lathe, incorporates a magnifying lens, to aid the operator in setting the attachment very accurately to the degree divisions marked on its set-up scale. Many times, high accuracy in a taper is of extreme importance. The

magnifying lens used for this purpose is made of Lucite, and is protected with a covering of glass. Located over the scale, it allows an operator to set up to an accuracy within .00001".

As for testing the accuracy of various tapers after they have been machined, some firms use a special sine bar taper testing fixture, provided by manufacturers of gages and related devices.

It consists of a 20" sine block, that is supported on sine plugs atop a precision surface plate. The sine block carries a pair of adjustable centers, between which tapered piece to be tested is mounted.

SUPREME *Super Duty Shear Blades*

"All the name implies"

LAI D CARBON

LAI D HIGH SPEED

SOLID HIGH SPEED

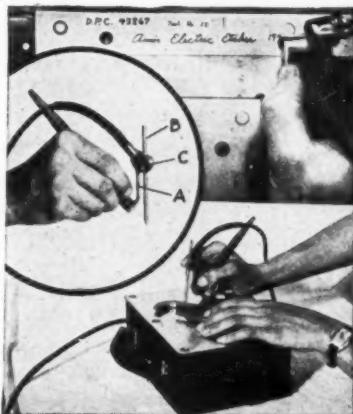
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ANNIS ELECTRIC ETCHERS

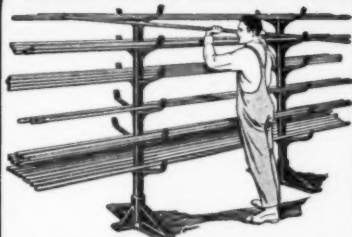
(for precision work)

with the stylus that stays cool

R. B. ANNIS CO.

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SAVES TIME
IN YOUR STOCK ROOM

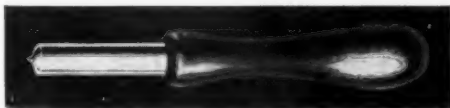


The **BROWN SECTIONAL RACK** saves the time wasted end-hauling stock from the old-style, closed-side rack and quickens the selection of sizes by greater visibility. Built of standard metal sections: can be expanded for changes in stock or growth of business. Made in 5 styles: can't burn, depreciation practically nil.

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BROWN ENGINEERING CO.

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SAFETY DRESSER
For HAND GRINDER

1/2 Carat.....	\$ 9.85
3/4 "	16.50
1 "	25.00

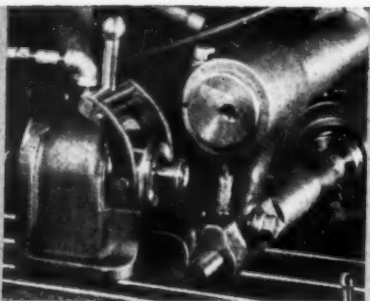
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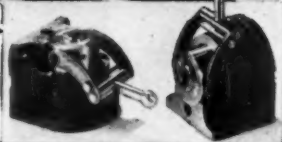
VERTICAL
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HORIZONTAL

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Zagar V-H



HOLDING FIXTURE WORKS BOTH WAYS

No more need for angle plates! The Zagar V-H Fixture has two right-angled faces milled with key slots in two directions on each face, adapted to any position on a drill press or milling machine. Ideal for drilling and tapping cross holes in round

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Get new Zagar Catalog "B"

ZAGAR TOOL, INC., 23882 Lakeland Blvd., Cleveland 17, O.



Zagar INDEXING
AND HOLDING FIXTURES

PORTABLE GRINDERS

There are many different types of portable grinders, and now and then still further variations appear. One of the things that has made portable grinders highly useful tools in the hands of toolmakers, is the high rotary speed now obtained, which makes the use of very tiny wheels practical.

Thus, the die maker can get into many places with grinding wheels, that are barred to wheels of larger diameter running at slower speeds.

Taking as a case in point, an electric grinder, geared to revolve the little mounted wheel at 50,000 rpm without vi-

bration, wheels as small as $\frac{5}{64}$ " in diameter, or barely over $\frac{1}{8}$ ", can be handled to advantage. This means that a radius not much in excess of $\frac{1}{16}$ " can be reached. This little machine can be used on a lathe toolpost if desired, but ordinarily it is fitted with a pistol grip for free-hand use.

Somewhat heavier portable grinders are used for work that is a step larger up the scale, and the speeds at which they run are proportionately less. One portable air grinder carries small abrasive wheels, abrasive discs, abrasive pencils, etc., and runs at a free speed of 22,000 rpm. The manufacturer of this tool, however, has portable air grinders in much larger sizes also.

Are you acquainted with the type of portable grinders known as rod grinders? They were originally developed for use in locomotive shops, for grinding loco-

motive main and side rods, valve motion rods, grinding welds on repaired side rods, smoothing the jaws in main rods to receive new brasses, and other similar work, where it is not possible to get a grinding wheel of sizable diameter into action, and yet considerable power and smooth grinding are needed.

A number of similar uses have been found for machines of this kind in various other industries, also.

If you occasionally get into a tight spot, with a grinding element small in diameter, but very wide and powerful, this is the type of tool to use. They are usually air driven.

The CRITERION Carbide Tool Grinder

**GREATER
PRODUCTION
CAPACITY**

Provides positive rapid adjustment to meet the rigid requirements of production tool manufacturing. Built for continuous service. Adjustable coolant system. Large work tables instantly adjustable without wrenches or other tools. One-third H.P. balanced precision bearing motor completely enclosed and radially mounted in rubber. Standard equipment: One 60 and one 100 grit 7" dia. steel backed silicon carbide wheels. Ideal for metal banded or Resinoid banded diamond wheels.



Order from your dealer or write direct. Request literature. No obligation.

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BEVERLY HILLS, CALIFORNIA



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THE "FORM-MASTER"

ANGLE & RADIUS DRESSER

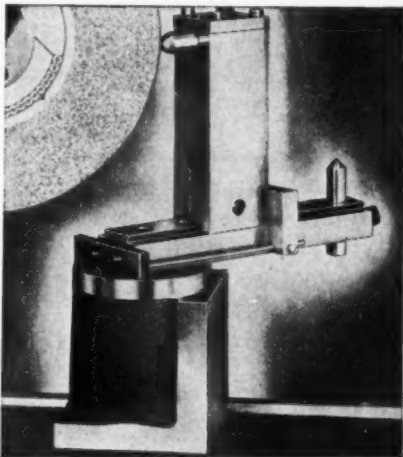
A sturdy, quality instrument designed by form-grinding specialists to dress both angles and radius at low cost. Two 1/3 ct. diamonds and instrument case included — \$150.00 complete.

Features

Large range.
Chatterless and dustproof.
.0001" accuracy obtainable.
Simple to operate.
Reasonably priced.

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**Example:
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VERSATILITY**

● Torque setting "Hi-Stress" Speed Nuts, manufactured by Tinnerman Products, Inc., is accomplished with a Federal Dial Feed Press—in one operation—at high speed! Says W. C. Kasper, Jr., "It gives us exactly the smooth feed we require."

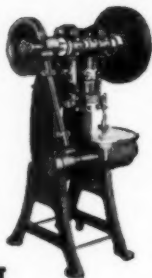
Every day these versatile Federal Presses are solving more production problems—performing a wider variety of jobs—saving time, work, and money. Write for a catalog.

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DIAL FEED
PRESSES**



**AVAILABLE IN
8 SIZES—
CAPACITY, 6 TO
80 TONS**

PHOTOGRAPHING PROJECTILES

A high-speed x-ray unit, capable of taking x-ray pictures as short as one millionth of a second, is used at Frankford Arsenal to photograph a rapidly moving projectile in a gun barrel.

Designed by Westinghouse for ballistic studies, this unit requires about 2000 amperes at 300 kv, or 600,000 kw for a microsecond. The tube can withstand these tremendous but brief floods of energy for a thousand pictures, but at exposures of a millionth of a second each, the total service life is but a small fraction of a second.

Arsenals apply this high speed x-ray

to determine the location of a projectile in a gun barrel with respect to the curve of gas pressure versus time, the effect of rapid acceleration on the component parts of composite projectiles such as explosive bullets, and the manner of progression of a projectile thru armor.

Pictures of actual penetration taken by ordinary photographic means are obscured by luminous fragments created by impact. One of the surprising facts revealed by these x-ray pictures taken in a millionth of a second is the swelling of explosive shells to almost twice normal diameter before they burst.

Such high-speed x-ray pictures are expected to have many non-military uses such as studies of rapid chemical reactions, movements of valves, springs, etc. of engines, or the flow of dirt thru a vacuum cleaner.

The high-speed x-ray equipment, is extremely simple. In many ways it is simpler than an ordinary x-ray machine. Essentially it consists of a surge generator that is charged slowly and then suddenly discharged thru a high vacuum tube.

The tube is of a special design to utilize the short pulse of a great peak of energy to produce a relatively high intensity of x-radiation.

The fact that the power is stored in capacitors suggests another use for it. By removing the x-ray tube and allowing the energy to be discharged as an arc in air, an excellent means is available for providing intense but brief illumination.

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STOCK

GEARS



SPROCKETS
SPEED
REDUCERS
FLEXIBLE
COUPLINGS

ARE LISTED IN OUR
NEW CATALOG
No. 61

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SWISS TYPE

GEAR HOBBER

... for Accuracy
and speed in
hobbing PINIONS
GEARS and
SECTORS

TWO MODELS

No. 00 SPUR GEAR
HOBBER (Illustrated)
for work up to
2" diam.

No. 1 SPUR and
SPIRAL GEAR HOB-
BER for work up to
6" diam.

Write for further
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TOOL CORP.

Sales Agents
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Manufactured by
The Hamilton Tool Co.
Hamilton, Ohio

METAL STAMPINGS

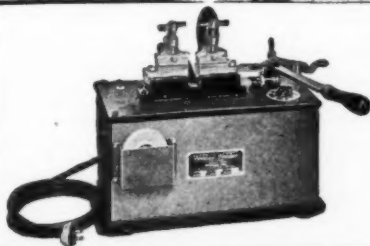
IN SMALL LOTS

Write for illustrated booklet No. 176-7.

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There is no other method of produc-
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that can equal the process originated
by Dayton Rogers Mfg. Co. No mat-
ter how intricate the design or how
small the quantity requirements, we
can show you a definite saving.



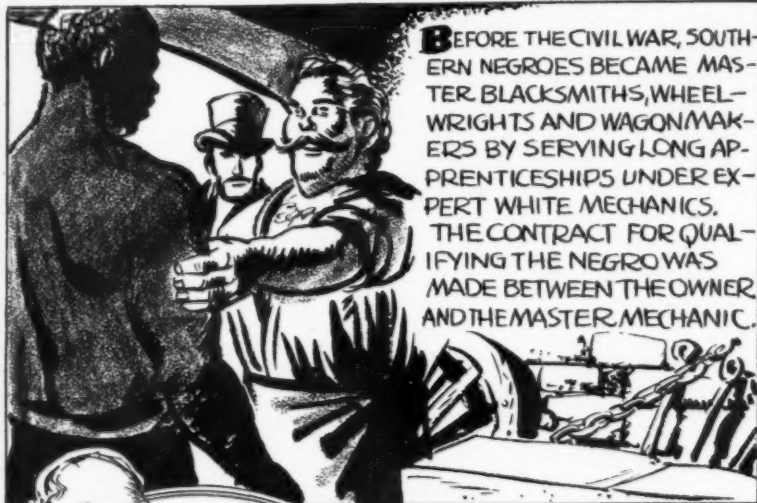
BAND SAW WELDERS

The No. 141 Bench Type Metal Working
Band Saw Welder is available with or
without grinder. Work can be annealed
without removing from the Welder. Band
saws up to 3/4" wide may be welded.
220 and 110 Volt, 60 Cycle, single phase,
5 point heat control, 1 point anneal heat.
Shipping weight 79 lbs. Let us send you
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Mfrs. of complete line of Spot, Butt, Seam,
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Mechanics Through the Ages



BEFORE THE CIVIL WAR, SOUTHERN NEGROES BECAME MASTER BLACKSMITHS, WHEELWRIGHTS AND WAGONMAKERS BY SERVING LONG APPRENTICESHIPS UNDER EXPERT WHITE MECHANICS. THE CONTRACT FOR QUALIFYING THE NEGRO WAS MADE BETWEEN THE OWNER AND THE MASTER MECHANIC.



ALTHOUGH THE BOILERS MADE FOR RICHARD TREVATHICKS PIONEER

STEAM ENGINES OF THE EARLY 1800'S WERE BENT INTO SHAPE BY HAMMERS AND HAD THEIR JOINTS CAULKED WITH ROPE YARN BEFORE RIVETING TO INSURE TIGHTNESS, THEY WERE CALLED UPON TO WITHSTAND PRESSURES UP TO 150 LB. PER SQUARE INCH!

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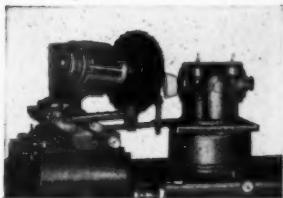
*Your
Answer*

TO LARGE FACE MILL GRINDING COVEL No. 22 UNIVERSAL

*Plus the Right
Attachments*



Close-up of Large Face Milling Grinding Attachment mounted on a COVEL No. 22 Universal Cutter and Tool Grinder. Attachment will support a large variety of cutters and tools; swivels 360 degrees vertically and horizontally, can be locked securely in any position.



Grinding larger size face milling cutters is the ultimate test of the capacity and versatility of a cutter and tool grinder. This operation calls for a machine rugged enough to take it — precision designed and constructed to perform accurately. The COVEL No. 22 Universal with

its specially designed Large Face Mill Grinding Attachment, is "taking it" every day in hundreds of plants — paying for itself in thousands of dollars and hundreds of production hours saved. It can do the same in your plant.

See Your Nearest COVEL Dealer or Write for Bulletin MT-15



GRINDING MACHINERY SINCE 1874

INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

PROMPT DELIVERIES
HIGH SPEED END MILLS
DOUBLE END



Two and Four Flutes

Dia. of Mill	Diameter of Shank	Length of Flute	Overall Length	Net Price
1/8	3/8	3/8	3	2.20
5/32	3/8	3/8	3	2.20
3/16	3/8	1/2	3	2.20
7/32	3/8	5/8	3 1/8	2.20
1/4	3/8	5/8	3 1/8	2.20
9/32	3/8	3/4	3 1/8	2.20
5/16	3/8	3/4	3 1/8	2.20
11/32	3/8	3/4	3 1/4	2.20
3/8	3/8	3/4	3 1/4	2.20
7/16	1/2	1	4 1/4	2.80
1/2	1/2	1	4 1/4	2.80
5/8	5/8	1 3/8	5	3.44
3/4	3/4	1 5/8	5 5/8	4.20
1	1	1 3/4	6 1/4	5.40

SINGLE END
Two and Four Flutes

Dia. of Mill	Dia. of Shank	Length of Flutes	Overall Length	Net Price
1/8	3/8	3/8	2 5/16	1.40
3/16	3/8	1/2	2 3/8	1.40
1/4	3/8	5/8	2 1/2	1.40
5/16	3/8	3/4	2 1/2	1.40
3/8	3/8	3/4	2 1/2	1.40
7/16	1/2	1	2 1/16	1.76
1/2	1/2	1 1/4	3 1/4	1.88
5/8	5/8	1 5/8	3 3/4	2.40
3/4	3/4	1 5/8	3 3/4	2.52

LONG SINGLE
END MILLS

Four Fluted

Dia. of Mill	Dia. of Shank	Length of Flutes	Overall Length	Net Price
1/4	3/8	1 1/4	3 1/8	1.68
5/16	3/8	1 3/8	3 1/8	1.68
3/8	3/8	1 1/2	3 1/4	1.68
7/16	1/2	1 3/4	3 3/4	2.08
1/2	1/2	2	4	2.16
5/8	5/8	2 1/2	4 5/8	2.76
3/4	3/4	3	5 1/2	3.44

VICTOR MACHINERY EXCHANGE, INC.
251 Centre Street **New York, N. Y.**

PROMPT DELIVERIES

NEW HIGH SPEED

SIDE MILLING CUTTERS



Diameter Inches	Face Inches	Hole Inches	Our Net Price Each	Diameter Inches	Face Inches	Hole Inches	Our Net Price Each
2	$\frac{3}{16}$	$\frac{1}{2}$	\$ 2.65	5	$\frac{5}{16}$	1	\$10.00
2	$\frac{1}{4}$	$\frac{5}{8}$	2.77	5	$\frac{3}{8}$	1	10.00
2	$\frac{3}{8}$	$\frac{5}{8}$	3.02	5	$\frac{1}{2}$	1	10.00
2½	$\frac{1}{4}$	$\frac{7}{8}$	3.40	5	$\frac{1}{2}$	1	9.51
2½	$\frac{5}{16}$	$\frac{7}{8}$	3.59	5	$\frac{3}{8}$	1	10.52
2½	$\frac{3}{8}$	$\frac{7}{8}$	3.78	5	$\frac{3}{4}$	1	11.46
2½	$\frac{1}{2}$	$\frac{7}{8}$	4.15	5	$\frac{7}{8}$	1	13.42
2½	$\frac{1}{2}$	$\frac{7}{8}$	4.15	5	1	1	13.42
3	$\frac{3}{16}$	1	4.10	6	$\frac{5}{16}$	1	12.50
3	$\frac{1}{4}$	1	4.10	6	$\frac{1}{4}$	1	12.50
3	$\frac{5}{16}$	1	4.35	6	$\frac{1}{2}$	1	12.50
3	$\frac{3}{8}$	1	4.54	6	$\frac{3}{8}$	1	12.50
3	$\frac{1}{2}$	1	4.79	6	$\frac{1}{2}$	1	12.50
3	$\frac{1}{2}$	1	5.04	6	$\frac{1}{2}$	1	12.41
4	$\frac{3}{16}$	1	5.67	6	$\frac{3}{8}$	1	13.92
4	$\frac{1}{4}$	1	5.67	6	$\frac{3}{4}$	1 or 1¼	15.12
4	$\frac{5}{16}$	1	6.36	6	$\frac{7}{8}$	1 or 1¼	17.89
4	$\frac{3}{8}$	1	6.36	6	1	1 or 1¼	17.89
4	$\frac{1}{2}$	1	7.12	7	$\frac{1}{2}$	1 or 1¼	18.00
4	$\frac{1}{2}$	1	7.12	7	$\frac{3}{8}$	1 or 1¼	18.00
4	$\frac{5}{8}$	1	7.75	7	$\frac{3}{4}$	1 or 1¼	21.67
4	$\frac{3}{4}$	1	7.75	7	1	1 or 1¼	25.39
4	$\frac{3}{4}$	1	8.38	8	$\frac{1}{2}$	1 or 1¼	25.00
4	$\frac{7}{8}$	1	10.00	8	$\frac{3}{8}$	1 or 1¼	25.00
5	$\frac{1}{2}$	1	10.00	8	$\frac{3}{4}$	1 or 1¼	28.00
5	$\frac{3}{4}$	1	10.00	8	1	1 or 1¼	33.64

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251 CENTRE STREET **NEW YORK, N. Y.**

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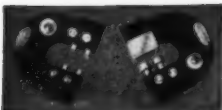
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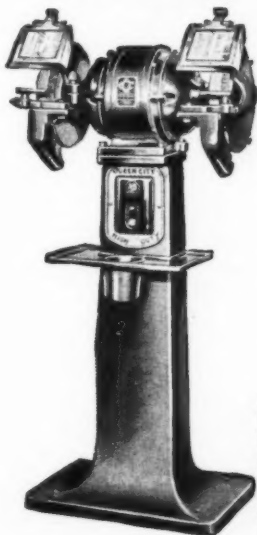
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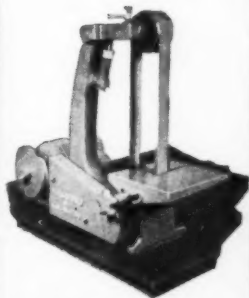
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Sossner	355		
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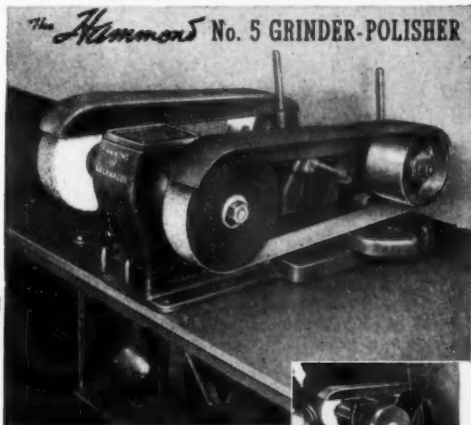
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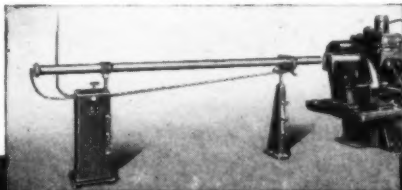
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